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CONTENTS.

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No. 1. *July.*

PAGE

Address to the Royal Geographical Society, 1906. By the Rt. Hon. Sir George Taubman Goldie, K.C.M.G., President 1

The Rhodope Balkans. By Lieut.-Colonel F. R. Maunsell, C.M.G., R.A. (with Sketch-map and 9 Illustrations) 7

Recent Change of Level in Alaska. By Prof. Ralph S. Tarr and Lawrence Martin (with Sketch-map and 8 Illustrations) 30

The Snow-peaks of Ruwenzori: their Probable Positions and Heights. By Lieut. T. T. Behrens, R.E. (with 2 Sketch-maps and 8 Diagrams) 43

The Physical Features of the Transvaal. By Tudor G. Trevor, F.G.S., A.R.S.M. (with Map, 2 Sketch-maps and 6 Illustrations) 50

Admiralty Surveys during the Year 1905. By Rear-Admiral A. Mostyn Field, F.R.S., Hydrographer 65

Reviews :—

ASIA—The Far East in 1905 67

AFRICA—The Rhodesia Ruins 68

HISTORICAL GEOGRAPHY—History of Cartography 70

The Monthly Record 72

Obituary of the Year 82

Meetings of the Royal Geographical Society, Session 1905–1906 82

Geographical Literature of the Month 88

New Maps 99

MAPS.

Sketch-map of the Rhodope Balkans 9

Sketch-map of Yakutat Bay 31

Sketch-map of the Vicinity of Lake Chrissie 53

Sketch-map of the Eastern Witwatersrand District 56

Map to illustrate the Physical Features of the Transvaal 104

No. 2. *August.*

Travels on the Boundaries of Bolivia and Peru. By Baron Erland Nordenskiöld (with 1 Sketch-map and 8 Illustrations) 105

The Economic Geography and Development of Australia. By J. W. Gregory, F.R.S., D.SC., Professor of Geology in the University of Glasgow (with 3 Sketch-maps) 130

The Geography of International Frontiers. By Major E. H. HILLS, C.M.G., R.E. 145

A Plea for the Investigation of Biological and Anthropological Distributions in Melanesia. By Dr. Alfred C. Haddon, F.R.S. 155

Notes to accompany Lieut.-Colonel Maunsell's Map of Eastern Turkey in Asia (with Map) 163

The Survey of India 165

Recent Research on Lake Chad 168

Earthquake Origins 171

PAGE

Reviews :—
AFRICA—The Problem of South Africa 172
AMERICA—Central Plains of the United States 173
POLAR REGIONS—History of Spitsbergen 174
HISTORICAL GEOGRAPHY—Early English Travel in the East 175
The Monthly Record 177
Obituary—Colonel M. S. Bell, V.C., C.B. Captain George Bennett Gosling. Israel Cook Russell. Nathaniel Southgate Shaler 187
Correspondence—Joris Carolus and Edge Island. By Edward Heawood .. 189
Meetings of the Royal Geographical Society, Session 1905–1906 190
Geographical Literature of the Month 190
New Maps 202

MAPS.

Sketch-map to illustrate the Routes of Baron Erland Nordenskiöld's Expedition in Bolivia and Peru 115
Sketch-map of the Geographical Divisions of Australia 133
Sketch-map of the Mean Annual Rainfall of Australia 136
Geological Sketch-map of the Berry-Moorlort-Loddon Lead 141
Map of Turkey in Asia 208

No. 3. *September.*

Recent Survey and Exploration in Seistan. By Colonel Sir Henry McMahon, K.C.I.E., C.S.I. (with 8 Illustrations and Map) 209
The Economic Geography and Development of Australia. By J. W. Gregory, F.R.S., D.SC., Professor of Geology in the University of Glasgow 229
Southern Peru: Notes on Two Expeditions. By C. Reginald Enock, F.R.G.S. (with 2 Sketch-maps and 5 Illustrations) 245
Recent Changes in the Course of the Lower Euphrates. By H. W. Cadoux (with Sketch-map and 6 Illustrations) 266
Geographical Work of the Geological Survey of Canada, 1900–1905. By A. P. Low, Director of the Geological Survey of Canada 277
The Results of the Foureau-Lamy Mission 280
Reviews :—
ASIA—The Malay Peninsula 283
AUSTRALASIA—Central Australia 285
The Monthly Record 289
Obituary—Khan Bahadur Yusuf Sharif 297
Correspondence—"On the Pretended Phœnician Circumnavigation of Africa." By E. J. Webb 297
Geographical Literature of the Month 299
New Maps 305

MAPS.

Sketch-map showing the Route of C. R. Enock in Southern Peru 247
Sketch-map showing the Route of C. R. Enock in Western Peru 259
Sketch-map showing the change in the course of the Euphrates River 267
Map of Seistan 312

No. 4. *October.*

The Indian Ocean. By J. Stanley Gardiner, M.A., Fellow of Gonville and Caius College, and Demonstrator of Animal Morphology in the University of Cambridge (with 8 Illustrations, Sketch-map, and Map) .. 313

PAGE

Recent Survey and Exploration in Seistan. By Colonel Sir Henry McMahon, K.C.I.E., C.S.I. (with 5 Illustrations) 333
The Rivers of Chinese Turkestan and the Desiccation of Asia. By Ellsworth Huntington (with Sketch-map) 352
Journeys in Northern Nigeria. By Hans Vischer, M.A. (with Sketch-map) 368
Twenty-five Years' Geographical Progress. By the Right Hon. Sir George Taubman Goldie, K.C.M.G., President R.G.S. 377
The Recent Californian Earthquake 384
The Valparaiso Earthquake 386
Reviews :—
AFRICA—The Nile. Liberia 387
AMERICA—The Volcanoes of Colombia 393
MATHEMATICAL AND PHYSICAL GEOGRAPHY—Geomorphology 393
GENERAL—Surveying Instruments. Hints to Travellers 394
The Monthly Record 396
Obituary—The Rev. George Grenfell 406
Correspondence—The Phœnician Periplus of Africa. By Dr. A. H. Keane and Edward Heawood 408
Geographical Literature of the Month 409
New Maps 419

MAPS.

Sketch-map of the Farquhar Group 325
Sketch-map of East Turkestan 355
Sketch-map showing Route in Northern Nigeria 369
Map of the Indian Ocean 424

No. 5. *November.*

A Fifth Journey in Persia. By Major P. Molesworth Sykes, C.M.G. (with Sketch-map and 6 Illustrations) 425
The Indian Ocean. By J. Stanley Gardiner, M.A., Fellow of Gonville and Caius College, and Demonstrator of Animal Morphology in the University of Cambridge (with 7 Illustrations) 454
Notes on the Geography and People of the Baringo District of the East Africa Protectorate. By C. W. Hobley, C.M.G. (with 8 Illustrations) 471
Ruwenzori and the Frontier of Uganda. By Douglas W. Freshfield (with Sketch-map) 481
Coast Erosion. I. By Clement Reid, F.R.S. II. By E. R. Mathews, A.M.I.C.E., F.G.S., Borough Engineer of Bridlington (with 2 Diagrams) 487
Geography at the British Association: York Meeting, 1906 495
Reviews :—
EUROPE—The Balkan Lands 499
AMERICA—The Selkirk Range 501
MATHEMATICAL AND PHYSICAL GEOGRAPHY—Survey Methods. Tides and Waves 502
The Monthly Record 503
Obituary—H. W. Cadoux. Dr. Karl Futterer 515
Correspondence—African Languages. By A. C. Madan 516
Geographical Literature of the Month 516
New Maps 532

MAPS.

Sketch-map to illustrate the Fifth Journey of Major P. Molesworth Sykes, C.M.G. 429
Sketch-map of the Frontier of Uganda 483

No. 6. *December.*

PAGE
The Alpine Races in Europe. By John L. Myres (with 7 Sketch-maps) .. 537
A Fifth Journey in Persia. By Major P. Molesworth Sykes, C.M.G. (with 7 Illustrations) 560
Bathymetrical Survey of the Fresh-water Lochs of Scotland. Under the Direction of Sir John Murray, K.C.B., F.R.S., D.SC., etc., and Laurence Pullar, F.R.S.E. (with Index-map, 6 Illustrations, and 8 Plates) 592
The Volcano of Smeroe, Java. By I. A. Stigand, B.A., F.G.S. (with 5 Illustrations) 615
Reviews :—
ASIA—Afghanistan. Central Asia 624
AMERICA—Alaska 626
GENERAL—History of Colonization. An Autobiography 629
The Monthly Record 630
Correspondence—The Fall of the Central African Lakes: Lake Nyasa. By Rev. Wm. C. Piercy. General Report of the Survey of India, 1903–04. By Colonel J. R. Hobday, R.E. Missionaries and Philology and Anthropology. By Rev. James Sibree. The Phœnician Periplus of Africa. By E. J. Webb 641
Geographical Literature of the Month 646
New Maps 657

MAPS.

Sketch-maps to illustrate the Alpine Races in Europe 540–551
Index-map of the Lochy District 593
Map showing the New Boundary of the Aden Protectorate 632
Sketch-map showing River-diversion 637
Plates of the Bathymetrical Survey of the Fresh-water Lochs of Scotland .. 664

The
Geographical Journal.

No. 1. JULY, 1906. Vol. XXVIII.

ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY, 1906.*

By the Rt. Hon. Sir GEORGE TAUBMAN GOLDIE, K.C.M.G., President.

At this Anniversary Meeting, the first over which I have presided, I propose to review briefly the work of our Society during the past year and its position to-day; but I must commence with one prefatory remark. In speaking of results achieved and of progress made, I cannot isolate the past year from its predecessors. In the Royal Geographical Society there are no revolutions. Successive presidents and councils take up the work which has been prepared by those who have gone before them; and, speaking for myself, I have been content to follow, as closely as circumstances have permitted, on the lines pursued by my distinguished and untiring predecessor, Sir Clements Markham, during the twelve years that he presided over us with such marked success.

So far as the general progress of the Society is concerned, we have reason to be satisfied. You will see in the Annual Report and the New Year-Book, which will appear this week, that during last year (as in the preceding years) a substantial addition was made to our members; but this is not the only, nor even the chief, sign that the Society is successfully holding its place amid the many and varied organizations through which the acquisition and diffusion of human knowledge are carried on. Personally, I am inclined to attach even more importance to the gradually increasing circulation of our *Journal* outside of the circle of the Society. You may remember that, about fourteen years ago, the scope of this publication was considerably extended so as to cover the whole field of exploration and geography. There had been previously no such permanent organ in the English tongue, and the success of the

* Delivered at the Anniversary Meeting, May 21, 1906.

experiment fully justified the step then taken by the Council. But scientific societies, like all other human institutions, can only prosper by continually adapting themselves to the changing conditions of their environment, and the Council, two years ago, wisely decided to place the *Journal* on public sale, and to exhibit the bills of its contents at the principal railway stations in the kingdom. The result has been a very large addition to the circulation of the *Journal*. I earnestly hope that this and similar steps may widely increase the spread of interest in geography amongst the general public. As testimony of the view taken by scientific men of the intrinsic value of the *Journal*, you may like to hear a few words from a letter recently received from Prof. Suess, when acknowledging his election as an Honorary Corresponding Member of our Society. Prof. Suess, as every one knows, is one of the greatest living exponents of geological and geographical science, and he writes, "The Society's *Journal* has for years been one of my richest sources of information, and I shall be happy to possess it in my library, and not to remain dependent upon public libraries."

You are aware that, in addition to our monthly journal, we issue at intervals extra publications of a character too lengthy or too technical to be suitable for our monthly number. During the past year we have published a volume of great interest and scientific value by Dr. Merzbacher, on his expedition to the Central Tien Shan mountains. The eighth edition of our 'Hints to Travellers,' which is used by explorers of all nationalities, has been exhausted for some months; but the ninth edition, under the editorship of our able map curator and instructor, Mr. Reeves, is now ready for publication. It has been entirely recast and greatly improved; the demand has been so great that we have had, most cheerfully, to print double the number that we printed of the previous editions.

In the instruction department under Mr. Reeves the work is constantly increasing. Officers and civil officials are sent every year by the Government departments to take the Society's diploma before entering upon their work. In other ways we continue to be on close relations with several departments of the Government, and even foreign governments have appealed to us to recommend competent men for carrying out the work of boundary delimitation.

Under the able and zealous care of Mr. Heawood, our library is constantly maintained at the level which you have the right to expect in a Society as energetic and abreast of the times as ours is.

Fortunately, we are not entirely dependent for this object on our own funds, often urgently required for other purposes, but are also assisted by the generosity of individual members. I must, on this occasion, specially refer to the magnificent donation made by one of our oldest Fellows, Dr. Alexander Peckover, Lord-Lieutenant of Cambridgeshire, who, from his early years, has been a diligent and

discriminating collector of geographical classics and rare maps. Mr. Peckover has generously presented to our Society nearly the whole of this valuable collection, thus completing many gaps in the library and map-room collection. Quite recently, also, Colonel Feilden, who, during the greater part of his lifetime, devoted himself to forming an Arctic library, has been good enough to present this rare and large collection to our Society, of which he is so distinguished a Fellow. It will interest you to know that the general index to the first twenty volumes of the *Geographical Journal* is almost ready for publication. It will form a volume of about 600 pages in double columns, and will be invaluable for purposes of reference. The general index to the fourteen volumes of the earlier *Proceedings of the Royal Geographical Society* is also well advanced; while the supplement to the Library Catalogue, covering the last fourteen years, is proceeding.

To some of the Fellows, as also to the general public, the evening meetings of the Society, held fortnightly from November to June, may perhaps represent our principal activity; but I think that most of you here present know that they form only a small section of the totality of the Society's work. Nevertheless, those fortnightly meetings undoubtedly play a very considerable part in the diffusion of geographical knowledge, and the general character of the papers which have been read during the last year is an indication of the continuous progress which has been made in our time, in raising the standard and widening the field of our subject. From the nature of things the majority of those papers have been records of travels, but these have displayed unmistakable evidence of the increasingly scientific character of the work of geographical exploration. I would mention as typical cases the papers of Dr. Seligmann on British New Guinea, of Sir Henry McMahon on Seistan, and of Baron Nordenskjöld on his researches in Bolivia. Nor has such work been confined to remote continents and islands. Much has been done both at our meetings and in the *Journal* to extend our knowledge of Europe itself. For instance, Colonel Maunsell's paper on the Rhodope Balkans was a useful contribution to the geography of a very little known part on the Continent. Mr. Hogarth's able paper on the geographical conditions affecting population in the East Mediterranean lands, and Mr. Spotswood Green's most interesting paper on the Spanish Armada, are striking examples of the light which geography is able to throw upon history. The series of papers by Sir John Murray on the Scotch Lochs, which have been continued in the *Journal* during the last year, and the paper by Mr. Victor Gatty in the current number of the *Journal* on "The Glacial Aspects of Ben Nevis," are instances of recent contributions to geographical knowledge of our own country. We have had other papers of a purely scientific character, such as that by Mr. Scott Elliot on the action of water-plants in Chile in building up land; by Prof. Davis on "The

Geographical Cycle in an Arid Climate;" by Prof. Schwarz on "The Rivers of Cape Colony;" and by Mr. Mackintosh Bell on "The Great Tarawera Volcanic Rift." In another department of the wide field of geography—the field which has been designated "Applied Geography," that in which is worked out the bearings of Geographical conditions on human activity and human interests—we had an admirable paper by Prof. Gregory on "The Economic Geography of Australia."

You are aware that the increasingly scientific character of our geographical work led to the establishment, some three or four years ago, of a Research Department, mainly devoted to discussions on subjects of too technical a character to be suitable for our fortnightly meetings. These discussions are, of course, open to all Fellows of the Society, but not to visitors, except by invitation of the Research Committee. This department has been active during the past year. One interesting discussion was that on Mr. Randall MacIver's views as to the date and origin of the Zimbabwe ruins in South Africa, a subject intimately connected with the early history of African exploration. Another valuable discussion was that raised by Mr. Scott Elliot's advocacy of an inquiry into the resources of the Empire. Dr. Nansen's paper on "The Oscillation of Shore-lines" also led to a lively discussion by specialists, and I understand that the Research Department may soon expect another paper from Dr. Nansen on the same subject. Certain points connected with the Seistan lake-basin involving technical scientific considerations were also brought before this department by Sir Henry McMahon. A discussion on a paper by Sir Clements Markham dealt with problems still to be solved in the north polar area, and it is in the attempt to solve these problems that Mr. Einar Mikkelsen is now making his way through Behring straits to Prince Patrick Land. Part of the funds required for the work has been furnished by our Society. Captain Lyons of the Egyptian Survey brought before the Research Department the subject of the Nile flood, which he has now expanded into a book (entitled 'The Physiography of the River Nile and its Basin'), published by the Egyptian Government. This elaborate work contains a mass of valuable information on a most interesting and important subject. Through the Research Department we are initiating an investigation into the changes which have taken place in the North Sea coast region of England during the historical period. The inquiry is a complicated one, and will require the assistance of many workers, but it is worth carrying out, as the results can hardly fail to be of value both to pure geography and to history. In the same way we have arranged for a special investigation of a limited river area in the Thames basin, with a view to discover the rate at which the land is being worn away through influences of rainfall and other causes. We have every reason to hope that in the near future, as trained geographical students become more and more

numerous, practical work of various kinds will go on increasing under the auspices of the Society.

I will say a few words on geographical work already completed, or in the course of completion, which has not yet been brought fully to the notice of our Society. Mr. Ellsworth Huntington, a young American explorer of a thorough scientific training, has just returned to this country from Central Asia with his companion, Mr. Barrett. I believe that Mr. Huntington has done much to solve some of the problems connected with the geography, the desiccation, and the archæology of Central Asia; but a full account from his pen will be published in the *Journal* very shortly. You all know that Dr. Sven Hedin has started on another of his great expeditions. He has already traversed Persia, and he believes that he has solved some of the more important geographical problems of the eastern provinces of that country. We understand that his next field will be Tibet. To us, as British geographers, it is somewhat tantalizing that the British Government has declined to grant permission to experienced British officers to enter Tibet or to explore the unknown reaches of its great rivers; but this is not the place for either approval or condemnation of the policy on which this decision is based. In the continent of Africa, the expedition under Captain Gosling and Lieut. Boyd Alexander has been at work in Nigeria, on Lake Chad, on the Shari, on the Mobangi, and in other regions for about two years. It is making its way to Lado, and may probably before long return down the Nile. Valuable results are expected from this expedition. Some of them have, indeed, already appeared in the *Journal*, including an excellent map of part of Nigeria by Mr. Talbot, one of the surveyors of the expedition. During the past year our Gold Medalist, Commander Peary, has made a fresh start for the purpose of reaching the pole. We wish him every success. Captain Amundsen, who, some three years ago, went out with two or three companions to carry out a series of observations around the north magnetic pole, has accomplished the North-West Passage. He has since returned to his companions, and will probably carry on the projected work for another year. Another interesting matter connected with the north pole region is the establishment of a Danish scientific station at Disco, on the west coast of Greenland, for the purpose of making continuous scientific observations. During the year Captain Scott's magnificent narrative of the National Antarctic Expedition has been given to the world, and we are now awaiting publication of the detailed scientific results. Meanwhile, the scientific results of the Swedish Antarctic Expedition have appeared in several large volumes, some of which are published in English. Strenuous efforts are being made by Lieut. Barne, R.N., to obtain funds for a small Antarctic expedition to supplement that in which he bore so admirable a part. In view of the heavy expenditure recently incurred by the Society in the National

Antarctic Expedition, your Council do not at present feel justified even in considering the question of a contribution to the new fund; but they fully recognize the importance of continuity in Antarctic exploration, and they have learned with satisfaction Captain Scott's emphatic opinion as to the qualifications of Lieut. Barne for conducting the proposed enterprise.

With regard to the ever-important subject of geographical education, we have every reason to be satisfied with the progress that has been made during the past year. We have excellent reports from Oxford, where, under the new reader, Dr. Herbertson, the school continues to flourish. The number of students during the present term has increased very largely over the past term, and not a few of them propose to devote themselves specially to obtain the full diploma of the school, which implies a very thorough mastery of the subject in all its departments. A special course of lectures by men of high standing in the different branches of the subject has been instituted there, and these promise to be completely successful. At Cambridge, also, we have reason to believe that steady progress is being made. There also a series of lectures has been initiated during the past year. Sir Clements Markham opened the series with a lecture on the Field of Geography. This has been followed by others by Sir Archibald Geikie, Mr. Hogarth, and Major Hills. Perhaps one of the most encouraging steps taken during the year was the issue by the Education Department of a syllabus for geographical teaching in secondary schools. It was hardly to be expected that, at the outset, this syllabus would be all that exacting geographers might wish; but on the whole it is satisfactory, and the mere fact that such a syllabus has been issued by the Education Department is highly significant of the important position which geography has assumed in education in this country, compared to what it was a generation ago. But this spread of geography in recent years, not only in secondary schools and in the universities, but in military and in other circles, is one which would demand an address by itself, and I have only been able to touch upon it here. I need not dwell on the increasingly important position which geography has been allotted in the examination of the University of London, largely due to the energy of Mr. Mackinder, who, as director of the London School of Economics, gives the subject a place of the first importance there.

The past year has in one respect been rather a sad one for the Society, as our obituary list contains the names of some of the most distinguished of our Fellows. Among our home list, I can only allude to the great loss which our Society and geography have sustained by the death of such men as Sir Mount Stuart Grant Duff, Sir Charles Wilson, Dr. Blanford, Sir John Farquharson, Sir William Wharton, Canon Tristram, Sir Coutts Trotter, Admiral Lindsey Brine, and Captain Wiggins. In Sir Augustus Gregory we have lost one of our

oldest Fellows, and one of the great early pioneer explorers of Australia. Among our Honorary Corresponding Members we have to deplore the loss of such distinguished explorers and geographers as Baron Von Richthofen, Major Von Wissmann, M. de Brazza, and perhaps greatest of all Elisée Reclus.

I commenced my address with a tribute—necessarily brief and inadequate—to the work performed by my predecessor, Sir Clements Markham, during his twelve years' tenure of the Presidential chair. I wish to conclude the address with a similar tribute to the indispensable work performed by Dr. J. Scott Keltie during the first year of my presidency, as, indeed, during the fourteen years that he has filled the post of secretary to the Society, throughout all of which period I have been in a position, as a member of your Council, to follow and appreciate his invaluable services. I do not, of course, imagine that any words of mine can add materially to the firmly-rooted reputation of Dr. Keltie, either in our great Society or amongst geographers of all nationalities. He is too widely known to need commendation from me. But I claim, as one of my privileges, to remind you of the fact which must be patent to many of you, that by far the greater part of such work of the Society as appears to be performed by me—including even the more solid material of this address—is really the work of our untiring, our zealous, our deeply experienced secretary.

THE RHODOPE BALKANS.*

By Lieut.-Colonel F. R. MAUNSELL, C.M.G., R.A.

The Rhodope Balkans is the name given to the series of ranges along the southern frontier of Bulgaria which shut off that country from access towards the Mediterranean. They form a part of European Turkey curiously little known, although the traveller in the Orient express to Constantinople skirts the foothills of the range on the north, and may admire its bold line of snowy summits, and also the coast to Salonica along the Ægean follows its southern slopes and traverses some of its gorges. Yet the actual country is seldom penetrated by travellers, and since the stirring times of the war of 1878, when some of the Turkish columns retreated through its passes, and its feudal beys organized a force to descend on the Russian line of communications, the country has remained forgotten.

The name "Balkan" in Turkish is a generic term referring to a range or mass of wooded hills with pasturage and meadowland on their slopes, rather than to a "dagh," or mountain, a name applied oftener

* Read at the Royal Geographical Society, March 12, 1906. Map, p. 9.

to the wild rocky ranges with inaccessible peaks and rugged slopes more common in Asiatic Turkey.

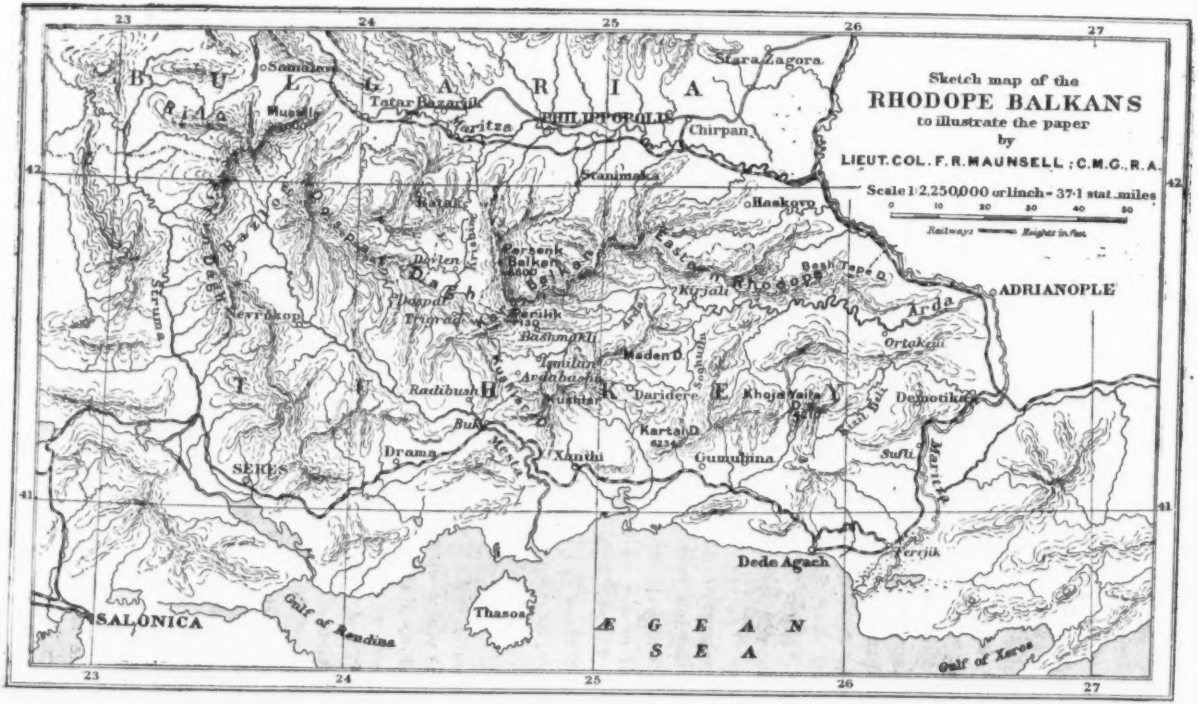
The main range of the Balkans which gives its name to the peninsula is known to the Turks as the Khoja Balkan, or "Father of Balkans," the central mass of the Rhodope is known as the Kara, or Black Balkan, probably from the dark masses of pine forests along its summit ridges. The high mass of the Rilo mountains is the Altun, or Golden Balkan, while another very beautiful and picturesque range is the Stranja Balkan along the Black sea from the Bosphorus up to the Bulgarian frontier—hills of no great height, but with densely wooded slopes and deep winding glades, affording very delightful scenery of a kind somewhat rare in Turkey.

The Rhodope Balkans commence on the west as a continuation of the Rilo mountains, a fine mass of hills which form the southern buttress of the Sofia plateau, and rise in the Musalla peak to 9600 feet. A sharp dip with a rugged col separates the Dospat range, which forms the north-west end of the Rhodope Balkans, from it, after which the general trend of the range is to the south-east, though at an elevation very much lower, of about 5500 feet. The central part of the range, the Kara Balkan, is to be found along the Bulgarian frontier south of Philipopolis, where the principal peaks are the Persenk, rising to 6800 feet, and the Perilik, at the turning-point of the frontier, to 7130 feet. Eastward of this the range practically divides into two long offsets, which enclose the valley of the Arda, one following the line of the Bulgarian frontier, and gradually getting lower until its foothills approach the Maritea near Adrianople, and another, a well-defined series of ridges which skirt the coast plain of the Ægean and trend to a central knot in the Khoja Yaila Dagh, which rises to 4210 feet, and sends out spurs to the coast at Dede Agach, as well as towards the Maritza on the east and the Arda on the north.

The many small streams on the northern slopes of the Rhodope emerge from their narrow valleys and gorges into the wide plain of southern Bulgaria, and there form tributaries of the Maritza, the great river of the principality most famous in national song and story, which leaves Bulgaria near Adrianople, and sweeps round the eastern end of the Rhodope to enter the sea near Dede Agach. The Arda is the chief river of the Rhodope, as it rises in the central part of the range, and flows between the two lines of hills forming the eastern end, receiving many tributaries on either bank, and finally escapes through a narrow gorge to join the Maritza just above Adrianople town.

The Kizil Deli Chai, or "mad red river," is a large mountain stream which drains into the Maritza from the eastern side of the Khoja Yailo Dagh, and is a rushing torrent throughout its course, which quite justifies its name.

On the south are no streams of any size flowing into the Ægean


Sketch map of the
RHODOPE BALKANS
to illustrate the paper
by
LIEUT. COL. F. R. MAUNSELL, C.M.G., R.A.
Scale 1:2,250,000 or 1 inch = 37·1 stat. miles
0 10 20 30 40 50
Railways
Heights in feet
BULGARIA
Samakov
Tatar Bazardjik
Philippopolis
Stara Zagora
Chirpan
Yaritza
Stanimaka
Haskovo
Batak
Dospat
Dorkovo
Dospat Dagh
Dorkovo Balkan
Dorkovo Balkan 4600
Dorkovo Pass
Dorkovo Pass 4130
Arabaka
Eastern Rhodope
Kujali
Basak Tepe
ADRIANOPLE
Arda
Ortakeui
Nevrokop
Serrena
Trigrad
Basmakli
Ismilan
Ardabasha
Mushtar
Radibush
Buk
Maden
Daridere
Khoja Yaila
Demotika
Kartal
Gumuljina
Sufli
Maritza
Drama
Xanthi
SERES
Dede Agach
Ferejik
Thasos
SALONICA
Gulf of Rendina
ÆGEAN SEA
Gulf of Xeros
23
24
25
26
27
41
42

from the coastal ranges of the Rhodope, the largest being the Yardimlu from the southern side of the Khoja Yaila, which traverses a wide cultivated plain east of Gumuljina, with meadow-land and patches of forest, on its way to the sea. At Xanthi a stream emerges just above the town from a rocky gorge, but it scarcely exists in summer, as its waters are used up for the town and the belt of gardens surrounding it, its shingly bed being dry.

Along the west side of the Rutodope is the wide basin of the Mesta, a large stream rising in the Rilo, and formed of many affluents from its foothills and the Pirin and Dospat ranges. It passes in a deep-cut valley through Razlog, and enters the little plain of Nevrokop, but soon resumes its character of a mountain torrent, forcing its way along a deep tortuous channel through a V-shaped valley between spurs from the Rhodope and some high ranges about Drama, towards the Ægean. At the little station of Buk, the Salonica-Constantinople railway crosses the river and follows its bank, traversing a small open basin at Buk, and then winding along a picturesque rock gorge through tunnels or in a cutting closely overhanging the water. It is only in the last few miles, when it has left the gorge and turned towards the sea, which it enters opposite Thasos, that the river is able to spread itself over a wide sandy delta and escapes from its mountain gorges. The Turkish name of the river is Kara Su, but as this is also applied to the Struma and many other streams, it seems best to retain the name Mesta, its former Greek name, which is also known to the Turks.

The general outline of the Rhodope presents no prominent peaks of striking grandeur rising above the general chaos of wooded or brown summits, but its chief beauty, especially in the centre and west, lies in its pine-clad summits and slopes, enclosing pleasant valleys, upland meadows watered by many rills, along which are villages of log-built houses, whose wooden roofs and general outline would remind one of the Tyrol, were it not for a certain irregularity of shape that must be oriental, and for the wooden tower of the minaret above the trees. These pasture lands along the slopes and the forests constitute its principal source of riches of the country, and form a pleasing contrast to the bare cultivated plains of the Maritza and the Ægean coast, which are scorched in summer and have few trees. There are no lakes at all in the Rhodope, and in this it loses somewhat in picturesqueness compared with the fine lakes of Okhrida and Prespa among the Albania mountains, or even with those of the Pirin Dagh close by, which has several beautiful lakelets on its summit plateaux. The Dospat Dugh, at the north-west end of the Rhodope, sends out a long spur into Bulgaria, which circles round over Batak, the principal village on that side of the frontier.

All these summits are thickly covered with pine forest, occasional open glades being available as pasturage, while the streams soon

disappear in deep narrow gorges choked with forest, or bordered by crags overhanging the stream tumbling over the boulders below, the district being extremely wild and picturesque, with few habitations outside Batak itself. The spurs to the north terminate abruptly over the plain of the upper Maritza, and the streams as they emerge are used to irrigate the rice and maize fields of the lower levels.

On the Turkish side the chief centre is Dospat, a large village of some three hundred houses, close round which approach the dense pine forests, although these probably will disappear in a few years if the present reckless system of cutting is continued. The place is still, however, famous for its sawmills, picturesque wooden buildings along the borders of the stream, which winds along below the town and supplies the necessary water-power to work the primitive machinery. The

SUMMIT OF KARA BALKAN, SHABANITZA UPLANDS.

southern slopes overlooking the Mesta valley are almost bare of trees. The Central Rhodope is the most picturesque part of the range, and is known at its western end as the Chadir Kaya, and at the east as Shabanitza, forming part of the Kara Balkan, and running up to the Perilik peak. The frontier of Turkey at this point projects forward as a long triangular tongue which reaches to Tumrush, only six hours from Philipopolis, and from the hills round which the Maritza plain can easily be overlooked. This is the Rupchuz "kaza," or district, and has its centre of government at Dovlen, a scattered place of some three hundred wooden houses at the bottom of a deep valley.

The Krishim stream drains this district towards the Maritza, being made up of a large tributary from Trigrad, and another from the hills over Batak, which emerges just above Dovlen from a splendid gorge bordered with towering crags, and filled with a dark thicket of forest

growth. If the track along the broad ridge of Shabanitza is followed, a succession of fine panoramas unfold themselves northward over Rupchuz, eastward over all the valley of the upper Arda, and westward towards the gorges of the Mesta and Nevrokop. Far away to the north in the shadowy haze is the long line of the main Balkan chain, with the Shipka pass and other historic features of the 1878 war. Below it is the fertile plain of the Maritza, with the corn and rice fields watered by the streams which struggle over the plain after leaving these hills. The middle distance is a tumbled mass of peaks, some bare and craggy, and some thickly forested, the black pine-clad peak of Persenk rising higher than the others; while many deep gorges trend down to join the Krishim stream, which can just be traced winding northward at the foot of a narrow V-shaped valley. Along the several heights can be traced the double line of huts and posts forming the frontier of Turkey and Bulgaria.

At our feet are dense masses of pine and beech forest, severed by open grassy uplands and glades, through which flow many small streams, which unite lower down to form the river of Trigrad. A glimpse of the wooden roofs and minarets of the village can be obtained, as well as its outlying farms and sheepfolds, which are occupied for the summer pasturage, and are dotted about the slopes in little clusters where the best grazing can be found. Just beyond Trigrad the stream enters a deep narrow gorge some 6 miles long, bordered by limestone crags and cliffs several hundred feet high, clothed with patches of beech and pine forest—a very striking bit of scenery in the middle distance. Winding along the slope near the top, and overlooking the gorge, is the narrow path which leads out of Trigrad towards the villages to the north. The more distant hills have almost lost their forests, and appear bare and brown; and the reckless way in which the trees are cut tends very rapidly to destroy their principal beauty.

Turning eastward, a splendid panorama of mountain scenery open out over the succession of wooded ridges and pleasant valleys down which flow the streams forming the headwaters of the Arda, and some of the roofs and minarets of Ardabashi ("the head of the Arda"), where are the principal springs which give rise to the stream, can be seen in the deep valley below. Farther north is the long line of the frontier ridge, with the valley of Bashmakli just below us, dotted with many small villages and mills along its stream. Immediately below us the slope of Shabanitza falls away very rapidly in a number of craggy spurs thickly clothed with beech and pine forest and a tangle of brushwood. About midway down open glades and meadowland appear, with the roofs of detached farms and sheepfolds, occupied in summer by people from villages out of sight in the deeper valleys beyond. Several sharply defined ridges, also well wooded, run out eastward as spurs,

enclosing the many small valleys which trend down to the Arda. Water-meadows extend along the streams, little clusters of pretty wooden-roofed houses, and here and there a water-mill, easily recognizable by the long wooden trough or shoot which carries the water from the upper channel down to the rim of the wheel.

Beyond these, in the middle distance, the forests almost cease, and bare shaly spurs with patches of red and yellow earth dip steeply from the brown summit of the Maden Dagh towards the Arda, and enclose the district of Egridere, or the "crooked valley." In the far distance the frontier ridges can be traced above Kirjali, with the bare rocky mass of the Khoja Yaila which overlooks the mouth of the Maritza, and also of the Karlik Dagh along the edge of the coastal plain.

Looking southward towards the Ægean, a belt of shimmering haze indicates the sea, and the high mass of Thasos island stands out boldly, with a mass of minor ranges on the mainland near it. A high wooded ridge runs out as a spur towards Xanthi, and rises again to the Kushlar Dagh and other ranges which trend eastward. The narrow gorge of the Mesta can be traced by a dip in the hills, but the stream is not visible. The scenery of this slope differs greatly from the others, as the grassy uplands give way to sharp stony spurs, with a forest of Scotch fir on the upper levels, but only scattered stunted oaks and brushwood lower down. Here the streams tumble over rocks and boulders or thread through narrow rifts and gorges on their hurried

CENTRAL RHODOPE UPLANDS NEAR TRIGRAD.

way towards the Mesta. Paths narrow and tortuous lead down these valleys, and are scarcely traceable among the stones except here and there. The stream is crossed by a picturesque stone bridge of one high pointed arch with a very narrow slippery roadway, and no side

walls to prevent the unwary traveller from falling into the torrent below. These tracks trend towards the station of Buk, on the Salonica railway, which has become the principal trade centre for this district since the line was opened. Looking westward along the summit of

CENTRAL RHODOPE: TRIGRAD VALLEY.

the range is the Chadir Kaya plateau, once well wooded, but now with only some scattered patches of trees. Its undulating slopes have a few patches of rye and barley cultivated by men from the hamlets far down the valley, and many of the detached summits are crowned by huge granite boulders, while on the slopes are scattered pines stunted and gnarled by being lopped for firewood.

Beyond Chadir Kaya a magnificent distant view opens across the Mesta valley, the horizon being filled in by the long sharply defined range of the Pirin Dagh with its rugged forest-clad slopes, while away to the north is the Rilo Dagh and Musalla peak, the highest summit in this country, just touched in October with the first snow. The actual stream of the Mesta is still invisible in its deep narrow gorge, but in the Nevrokop a few reaches glimmer in the sun, and the white houses of Nevrokop show up in a belt of gardens against the hills on the far side of the plain.

The population of the Rhodope is almost entirely Moslem, the Eastern Rhodope exclusively so, except for a few Christian Bulgarian villages in the Bashmakli valley, while the long tongue of Turkish territory forming the Rupchuz district is also all Moslem; indeed, at one time it formed part of Bulgaria, but owing to the strenuous resistance of its inhabitants to Christian rule, the frontier was readjusted and the country restored to Turkey. On the Bulgarian side of the frontier, with the exception of a few scattered Moslem villages, the inhabitants are Christians. The most interesting section of the population are the

Pomaks, or Moslem Bulgarians, people who became Moslem at the time of the Turkish conquest in the fourteenth century, and who form the principal part of the inhabitants of the Central Rhodope, and numbering some 100,000 throughout European Turkey, where they occupy districts along the Vardar as well as these hills. It is among the mountains that the people can best be studied, as in other districts in the Vardar valley they have become more merged in the general Moslem population. Here they inhabit all the Ahi Chelebi district, all the central range and the Rupchuz district, as well as the Dospat ridge to the west. In Ahi Chelebi there still remain some of the Pomak "derebeys," or feudal leaders, such as at Ismilan lives Salih Pasha, a celebrated hero of the 1878 war, who, when the Russians were moving past Philipopolis, raised an irregular corps from his retainers, and carried on a guerilla warfare against the Russian communications. Another of the same family is Hassan Pasha, who received me in quite the ancient style. His servants and retainers lined the avenue of approach to his house, picturesquely situated among meadows by a stream; he himself stood in the gateway to receive the guest, and his sons pressed round to wait. But, as in other parts of Turkey, independence among these "derebeys" is discouraged, few now remain with any power, and the ordinary civil government generally obtains. The Pomaks wear no distinctive dress, except that the women of particular districts in the mountains have special fashions in clothes, like in most of the

CENTRAL RHODOPE: VALLEY OF KRISHIM RIVER.

districts in Bulgaria over the frontier. Those of the Rupchuz generally dress in red, with a black cloak edged round with yellow braid, and a white kerchief on their head. Their language is a dialect of Bulgarian which they call Pomakje, or, better still, Airanje for choice, although the derivation of the latter term is rather obscure.

There are several dialects in the hills, and those in the Central Rhodope say they cannot understand the Bulgarian of those of Nevrokop, and so on. In the valley just below Bashmakli, on a tributary of the

CENTRAL RHODOPE: CHADIR KAYA RIDGE.

Arda, is a compact group of villages of Christian Bulgarians, comprising Raikovo, Chatak, Vlahova, and others, a very thriving settlement, interested in manufacturing woollen cloth of all kinds in small primitive mills worked by the water-power of their stream. It is woven in their homes on hand-looms from native wool, dyed various colours by natural dyes; it is then taken to mill, steeped in water, and submitted to a kind of hammering process which improves the texture, making it closer. The machinery of the mill is almost entirely of wooden beams; an overshot waterwheel supplies the power which drives a wood axle, projections on which make rise and fall, through a distance of about 18 inches, heavy beams fixed nearly vertically, and which hammer and press together the lengths of cloth placed in a wooden trough beneath them. The heavy throbbing sound of these hammers makes a strange noise as one passes up the valley to Raikovo and Bashmakli, and in the secluded valleys of the Central Rhodope. The Christians of Raikovo manage to turn out quite excellent tweed and woollen cloths of all kinds by these mills. Many of the inhabitants are tailors, who carry the goods to various towns on the Ægean coast, and even the Greek islands, and make up suits from it. Others of the inhabitants are builders and carpenters, who monopolize this kind of work in Gumuljuia, Xanthi, and other coastal towns, so that the little settlement gets on well.

The Moslem Pomaks in other parts of the district make their cloth in these mills, but only of the coarser kind for cloaks ("abbas"), which find a market in Constantinople. In the Dospat Dagh and the Central

Rhodope, and in the village of Dospat especially, are many small saw-mills, with primitive machinery worked by water-power for sawing logs into planks. The logs are only some 6 feet long and 2 feet diameter, and are cut into planks, which are transported on mules to the coast ports, caravans of these being frequently met with winding along the mountain tracks. A curious feature is the semi-nomad population of usually called Kutzo-Vlachs, locally known as "Karakachans," who spend the summer on these hills of the Central Rhodope, and winter in the plain country about the mouth of the Maritza and near Gumuljina. They are said to have come about one hundred years ago from the Southern Pindus, when they formed one of the tribes or parties during the great struggle of the famous Ali Pasha of Yanina against the Turks in the beginning of the last century; and when that old chieftain was being brought to bay in his fortress of Yanina, these people betrayed him and went over to the enemy. On a settlement being effected they found it impossible to remain, and had to fly to the Rhodope, where they remain in a kind of permanent exile ever since. They own large flocks of sheep, ponies, and cattle, speak Greek, and belong to the orthodox Church. They form parties or tribes of a combination of fifteen to twenty families under a recognized leader, and build themselves in summer a sort of log hut or wigwam out of boughs and branches, lengths of pine bark being used as a carpet on the floor. They number altogether about 5000 in Central Rhodope, and parties were met on their migration to the plain about the middle of October. Their dress is that of the Greek peasants. Other parties are found in the Kirjali district further east, where they can also obtain grazing. These mountains produce little for export, except it be some timber, wool, and cloth of local manufacture. The logs are either sawn in short lengths for mule transport, or are thrown into the Krishim stream, down which they drift until they reach the Philipopolis plain, where they are collected by men employed by Bulgarian contractors. The finest timber, in large logs 20 to 30 feet long and 20 inches or more in diameter, is obtained from the forests round the headwaters of the Mesta, and these are also thrown into the river to float down until opposite the Buk railway-station, where they are caught by grapnels as they pass and brought to bank.

The Scotch firs on the south slope of the central range are cut for railway sleepers, and floated down a stream to Buk also. The forests along the actual summit are of larch chiefly, and some beech with thick undergrowth, while lower down the Trigrad stream more oak and beech appear. On the Chadir Kaya are some thick low patches of dwarf juniper—some of the large juniper—birch, wild pear, and apple trees. There are some fine walnut trees in the lower valleys. Resin, or "katran," is boiled out from the pine wood in large pans, where it is burnt with charcoal, the resin running out of a hole at the bottom. Rye, oats, and barley are grown on the higher slopes, and

maize in the lower valleys, while round Trigrad is a large production of potatoes (called "kompir" by the Pomaks), which form the principal food of these, and are also exported. The districts of Xanthi (Eskeje) and Drama on the coast plains are celebrated for the fine quality of cigarette tobacco produced, and it is also grown in the minor valleys on the southern slope of the Rhodope, but the quality of leaf deteriorates rapidly as higher levels are reached.

No minerals are actually worked, and the hills have never thoroughly been explored, although traces of gold and silver lead are said to exist near Trigrad, and also at Radibush on the southern slope is said to be copper or zinc. In the island of Thasos, in the Ægean, close by is one of the richest zinc-mines in the world, worked by a German company. The general formation of the summit range of the Central Rhodope is of granite, much disintegrated, leaving rounded slopes, with an occasional boulder showing; while on the lower spurs both to the north and south sandstone and limestone appear. Some big game is to be found, but is extremely difficult to dislodge from the dense forests, and an army of beaters has to be employed to drive them across the open glades. As each arrives armed with some ancient weapon of his own and determined to have his share in the sport too, uncertain and dangerous elements are introduced. Grey bears (*Ursus syriacus*) and the brown variety are to be found, also the red deer of Anatolia, but they are scarce and difficult to obtain. Wolves are numerous, and pig also. The badger, the fox, and the tree marten are also to be found, but the last named is becoming rare now, owing to the price obtained for its fur. Excellent trout-fishing is obtained in the upper Arda, the Trigrad, and other small streams at the higher elevations.

VALLEY NEAR BUK, SOUTHERN SLOPE OF KARA BALKAN.

Of minor animals may be remarked some huge black lizards with bright yellow spots, which appeared in some numbers after a heavy shower, and waddled about the path, their legs seeming too short to allow them to run. The zeptieh's story regarding them, which he

repeated with solemn assurance, was that they had just then dropped from the clouds; in reality, the rain coming after a long spell of dry weather had apparently attracted them from their holes and hiding-places.

There is, I think, no trace of ancient remains of cities or settlements in this part of the Rhodope, but on the road from Trigrad over the pass leading south to the railway in the Mesta valley, known as the Meshatli Gedik, is the tradition, which seems general, of a great battle which took place over a thousand years ago, but the names of the combatants are now forgotten.

The country of the Eastern Rhodope is less picturesque than the central range which I have just described, as the forest has largely disappeared, the summits are bare or nearly so, and the slopes are so steep as to afford no room for the pleasant meadows and pasture-land of the higher ranges. As all the streams flow inwards towards the Arda, and this flows eastward to the Maritza at Adrianople, it follows that the country remains quite isolated and shut in by high ranges both north and south. Only a few minor streams drain into the Ægean, and no convenient valleys exist which would afford access from southern Bulgaria towards the Ægean, and thus that country has to find access to the southern sea by the railway along the Maritza valley to the port of Dede Agach.

The wall of coast ranges continues in spurs of the Central Rhodope to the Kushlar Dagh over Xanthi, which is apparently one mass of rock with only a few patches of vegetation, owing to deforesting

CENTRAL RHODOPE: GROUP OF POMAKS OF MIKHALOVO.

but one result is that most of the earth has washed down to the lower foothills, and on these are the most valuable fields for growing tobacco.

A very picturesque track winds up the valley north of the Xanthi,

and soon enters the wooded country, crossing two high ridges among oak, ash, and beech forest, on its way Ahi Chelebi and Bashmakli, the seat of the kaimakam, or local governor. This is the best way to reach these districts from the railway, and affords comparatively easy access. Farther east, along the line of hills which appears as a continuous wall of grey rocks from the coast, is the prominent peak of the Karlik Dagh, which rises nearly sheer out of the plain, and is 6200 feet at the summit.

The road from Gumuljina, the local capital of all the Eastern Rhodope, passes over a wooded col at the east end of the Karlik Dagh after a long ascent, passing the ruins of an old stone castle which once barred this route, which is the principal way into the Arda basin from the south. Farther along, the mountains curve northwards to the Khoja Yaila mount, whose rocky summit forms the last principal outlier of the Rhodope to the east, overlooking the valley of the Maritza. Rugged spurs covered with oaks radiate in all directions from it, and run down towards the sea at Dede Agach, the whole of this part of the Eastern Rhodope forming a very wild and impracticable tract draining by the Kizil Deli stream into the Maritza.

The Arda is the great river of the Eastern Rhodope, rising, as we have seen, in the Kara Balkan at the springs of Ardabashi, flowing at first through pleasant meadows and past pine-clad slopes, and turning many primitive mills, until it reaches the end of the Maden Dagh, and there it enters a narrow difficult gorge with steep slopes of loose shale and rock, nearly bare, except for a few scattered trees and brushwood, and along which rough paths gain only a difficult foothold, until the basin of Kirjali is reached and the valley widens. Here the stream is usually rapid over a wide bed of shingle and stones, subject to violent freshets, which have several times carried away the wood trestle bridges by which the road crosses to Kirjali, the principal centre of the northern part of the district.

Just here two large tributaries join from the south, besides many small streams from the frontier hills. One is the Soghutlu, which rises in an intricate wooded district on the east slope of the Kushlar Dagh and enters Daridere, or the "narrow valley," a very appropriate name, as very steep slopes of shale and earth rise on either hand, and the habitations and strips of cultivation occupy a very narrow strip alongside the rushing stream. The Soghutlu sweeps round the bare mass of the Maden Dagh and enters the long valley of Mastanli, spreading out over a wide bed of shingle like the parent stream, but having a considerable extent of maize cultivation, orchards, and gardens dotted with homesteads now on either bank.

The other southern tributary is the Burgas Chai, which is formed from many streams of the Karlik Dagh and hills east of it, the slopes here being wooded along the summit, but bare lower down and

enclosing very deep narrow valleys, the narrow strip of green orchards and cultivation, with an occasional small village, showing the course of the stream far down below. The stream rapidly increases and enters the district of Sultan Yeri, a very fertile area, the shingly bed of the stream being now bordered by trees and cultivation in a wide belt.

As it leaves the Kirjali basin the Arda enters a long winding gorge between wooded hills before it finally reaches Adrianople plain. The slopes are so narrow and steep that foothold is only obtainable for the merest tracks, and this district is very wild and impracticable. The frontier ridge, here known as the Besh Tepe, or Five Hill range, is densely wooded, and game abounds in it, but is, as usual, difficult to obtain without organizing a large drive.

AHI CHELEBI DISTRICT: VILLAGE NEAR BASHMAKLI.

On the steep slopes and spurs cultivation is generally in terraces, with some patches of woodland; maize and tobacco of inferior leaf being grown. There are no regular villages, but isolated houses or hamlets of stone with a roof of rough slates are dotted about in the most accessible places on the steep hillsides.

The most fertile part of the country lies in the wider parts of the valleys as they approach the Arda in the districts of Mastanli or Sultan Yeri, or the "Sultan's Place," so-called because of its fertility. Here the cultivation, trees, and orchards completely fill the valley, except for the wide strip of shingle of the stream-bed, and the mass of dense dark green foliage, relieved occasionally by the walls of a little white hamlet or a slender minaret towering over the trees, forms a pleasant contrast to bare steep border-slopes of the valley. The hamlets are very scattered up the valleys, and there are few villages of any size; but Kirjali, on the Arda, is the principal seat of government. The

district exports very little surplus produce, except, perhaps, a little corn and maize and an excellent kind of apples for which its orchards are famous, and little from the outside world disturbs its peaceful valleys. One useful product is the very fine breed of mules obtained in this district, and which are disposed of at the annual fairs held at Gumuljina and other places in the hills, usually in the spring. The only part of this country which has thick forests is along the deep valley or gorge of the lower Arda on the Bulgarian side, where is a wooded district, with many scattered farms along the Besh Tepe Dagh. The population of the Eastern Rhodope is exclusively of Turkish origin, and few, if any, of the Pomaks, or Moslem Bulgarians, are to be found.

The Eastern Rhodope was settled by immigrants from Asia Minor at the time of the first Turkish invasion in the fourteenth century under Sultan Murad I., when Adrianople was their capital, and the Greek emperors still reigned in Constantinople. They retain many of the qualities of the hardy races of Anatolia, and are quiet and peaceable, cultivating their little terraces of rye or wheat along the hill slopes, or tending their maize-fields and orchards in the valleys. A general exodus of the men takes place in the early summer towards the plains of Adrianople or Gumuljina, to be employed as labourers to gather the harvest just ripening there, and when that is done they troop back to reap their own harvest, which is some weeks later at the higher elevations. There is no Christian population in the actual basin of the Arda, but in the hilly country extending down to the sea at Dede Agach are many villages of Bulgarians. In the coast towns and in Xanthi and Gumuljina are a considerable number of Greeks, generally engaged in shipping or in the trade of the coastal plain, but very few penetrate into the mountain districts.

The eastern slopes of the range overlooking the lower Maritza valley has a belt of fertile foothills, although the slopes are generally rough and steep, and covered with patches of sparse forest and brushwood. Ferejik, Sufli, and Demotika are small towns at the base of the hills along the railway. Sufli, or Sofali, contains four thousand inhabitants, mostly Greeks, and is surrounded by a wide belt of mulberry gardens, for the place joins with Adrianople as a silk-producing centre, while on the near slopes are extensive vineyards which produce a rough red wine. Demotika is a place of eight thousand inhabitants, mostly Moslems, very picturesquely situated at the mouth of the valley through which the Kizil Deli river emerges from the hills, and is built like an amphitheatre at the foot of a cliff, on the summit of which are the ruins of an old castle, probably of Byzantine origin, but chiefly famous as having been used in 1709 as a prison for Charles XII. of Sweden, who fled to Turkey after the battle of Poltawa, and was detained here about a year by Sultan Ahmed III. Another very pleasant little town at the foot of these hills is Ortakeui,

connected with Adrianople by a good driving road, and used as a summer resort by the people of that place, while the hot sulphur baths at Ilije close by are also found beneficial.

The wooded spurs and foothills, which rise above the town to the east and over the gorge of the Arda as it emerges into the plain, form a very effective background to the little town built halfway up their sides, surrounded with mulberry gardens and orchards on the lower slopes, and with vineyards planted in the rich red earth of the higher levels. On the summit of a prominent conical hill a few miles west of the town are the ruins of an old castle of Hissarlik, just traceable, probably of Byzantine or even earlier origin, as the summit offers an ideal site for a watch-tower over all the country towards the Maritza,

THRESHING SCENE IN THE KARA BALKAN.

with the great plain of the Ergene river extending almost to the horizon. It guarded also the principal entrance into the Eastern Rhodope country from this side.

Through Ortakeui a good path now leads into Sultan Yeri and Kirjali, and is a picturesque road to follow, as the road, after ascending through the vineyards of Ortakeui, which cling to the steep slopes for some way above the town, follows for several miles the nearly level ridge of a spur which affords an extensive view for several miles over most of the Eastern Rhodope country. Along the ridge is a fair amount of cultivation and many small villages, generally a very scattered collection of small slate-roofed houses surrounded by a few trees.

To the south a succession of very fine panoramas unfold themselves. The principal object is the long stony ridge summit of the Khoja Yaila, which has abundant pasture land midway up its slopes,

as the name "Father of Pasturages" would imply. In front is an extensive view over the many ridges which fill up the country along the Arda, apparently a tumbled mass of brown hills, although a closer approach affords a view into the fine valley of Sultan Yeri with its mass of dark green orchards; in the distance is the Maden Dagh, and beyond the higher summits of the Kara Balkan.

The view towards the north, over the Arda gorge into Bulgarian territory beyond, is over a mass of dark wooded hills, rising sharply to a line of comparatively low summits which form the frontier ranges. Here and in the district round Kirjali on some of the higher ridges, is some good pasturage in woodland glades between the forest like the Central Rhodope.

As regards minerals, these districts of the Eastern Rhodope have never been thoroughly explored for that purpose; but probably, from the name Maden Dagh, or Mine mountain, some old workings must have existed there—in fact, there are traditions to that effect—while in recent years it is known that there are several places where petroleum may be found in the southern spurs of the Khoja Yaila Dagh leading down towards Ferejik, but no workings have yet commenced. The winter climate of all the elevated districts is necessarily severe, and the snow remains from the end of November to the beginning of April as a rule, but in summer the hills are a pleasant refuge from the malaria and heat of the coast plains along the Ægean, although in some of the deep narrow valleys along the Arda considerable heat is felt too.

The whole district of the Rhodope Balkans, from the fact that it is naturally so shut in and without easy avenues of approach, remains a country quite apart, and it is subject to no disturbance to the even tenour of the life of its inhabitants, who are generally peaceable and supply some of the best soldiers that the Sultan has in his European battalions. Neither has it a history, either ancient or modern, as its mountains afford no passage from north to south, and it has always lain apart from the track of invading and conquering armies on their way towards Constantinople or along the Ægean, and its mountains have acted as a shelter to various races who have drifted aside from the general tide. Yet its pine forests, pleasant uplands, and meadows by its streams, with its little alpine villages of wooden chalets, have a picturesque charm rather rare among the wild mountain scenery of the rest of the peninsula, and would well repay the traveller a visit.

Before the paper, the PRESIDENT: Colonel Maunsell is an artillery officer, who twelve or fourteen years ago travelled in Kurdistan and gave us a valuable address, the more valuable owing to his excellent map. Some years afterwards he filled a consular position in Turkey in Asia for about two years, during which time he travelled extensively. He gave us a second address upon southern Kurdistan, also illustrated by a map based on his own surveys. He also contributed to our

Journal a paper upon the Mesopotamian petroleum fields. In 1901 he was appointed military attaché to the British Embassy at Constantinople, and, active as usual, and following out that fine motto of his regiment to go "Ubique, quo fas et gloria ducunt," he gave much attention to the less-known parts of the Balkan peninsula. I may mention, also, that there will shortly appear in our *Journal* a very valuable map of the greater part of Turkey in Asia, which has been furnished to us by Colonel Maunsell, by permission of the War Office, and which obtained for him the Gill Memorial in 1905. I now call upon Colonel Maunsell to read his paper.

After the paper, the PRESIDENT: We have with us to-night the Right Hon. James Bryce, who has come here from more exciting scenes to spend an hour in the calmer discussion of geography. Mr. Bryce is, as we all know, a world-wide traveller, and as he was in the Balkans last year, I feel sure you will be glad if he will open the discussion.

The Right Hon. JAMES BRYCE: I did not come here with the intention of saying anything, but to have the pleasure of listening to Colonel Maunsell's paper, which I have done with the greatest interest. I am sure he deserves our thanks for having given us a very lucid and detailed account of a region which, although not very far distant from us, has been up to now very little known to geographers. Indeed, it is remarkable, considering how much attention has been called to that region by political circumstances, that a country which is surrounded by civilization and which is environed by two railways, one on the south and the other on the north and east, should have remained so little known. Scarcely any travellers seem to have, during the last hundred years, penetrated into the recesses of those valleys which Colonel Maunsell's paper has dealt with. The region which he has so well described is to me almost entirely unknown—that is to say, I have seen most of it only from a distance in traversing the plains and crossing the ridges which lie to the south of it. The part of the Rhodope which I do know is a little further to the west, and what I should like to say, if it is of any interest to you, is with regard rather to that western region. Let me remark, however, that one part of the south-eastern Rhodope, the part which lies between Drama and Dedeugutch, or, speaking more strictly, between Xanthi and Drama, contains one of the most beautiful pieces of scenery I have ever seen. It is a valley something like 30 miles long, traversed by a river where the railroad has been run along the very edge of the stream. Mountains rise from 2000 to 3000 feet above the stream; they are in part richly wooded, and break in splendid crags down into an excessively narrow valley, along which there is no passage except the railway. The winding gorge, with these limestone crags towering above it, is wonderfully picturesque. Colonel Maunsell will, I think, agree with me there is hardly a more beautiful piece of railway scenery in Europe, or perhaps in America either, and it can be seen in perfect comfort in travelling along the line. The part which I know better is in the extreme north-west, and includes the peak of Musalla mountains, lying to the south and south-south-east of the town of Sumokov. That is the highest point of the Rhodope group, and higher than any part of the Balkan range proper, the range, that is to say, which runs along the north bank of the Maritza. It may be easier for those whose knowledge of ancient geography, acquired at school years ago, is perhaps still more exact than their familiarity with modern names, if I remind you that the Rhodope may be said shortly to lie between the valley of the Strymon or Struma on the west, and the valley of the Hebrus or Maritza on the east—that Hebrus which is famous in mythology as the stream on the banks of which Orpheus was killed by the Bacchants, and whose waters carried his head down to the Ægean sea, according to Milton's line—

"Down the swift Hebrus to the Lesbian shore."

The Hebrus on the east and Struma on the west include the whole of the group of Rhodope mountains, and I think I am right in saying there is no road and no pass over the mountains between those two points. There is a very rough road leading from Serres on the Turkish side, which passes by an easy ascent into western Bulgaria, and descends into Sofia past the town of Radomir. Colonel Maunsell has told us there are few historical references to (and few traces of ancient works) this region, either in ancient or modern records. The reason doubtless is that the country was too impassable to be a road for the passage of armies. The mountain group to the south-east of Sofia, due south of Samokov, is the most picturesque and most striking of any part of the Rhodope. The chain attains its maximum level in the peak of Musalla, whose height is something over 9000 feet. Immediately to the west of it there is a range of very bold and striking mountains, across which Prince Ferdinand, the ruler of Bulgaria, has lately begun to construct a very good carriage road, which crosses over a pass at a height of nearly 8000 feet. Here there is a group of exceedingly picturesque mountains, some of which approach 9000 feet, and which are composed of old crystalline rocks, granite, and gneiss. North and south of this granite nucleus there is a band of slate rocks. I visited it in the end of September, when, though there were small patches of snow left, the summer and autumn flowers had almost entirely disappeared, but I was able to find a few flowers and seeds still left, which enabled one to say that the mountain flora is, broadly speaking, similar to the flora of the highest Alps, and not altogether unlike the flora of the highest mountains of England and Scotland. One finds the same genera, and a few even of the same species, appearing. The monastery of Rilo, which is the most famous of all Bulgarian shrines, lies in a deep valley south of this mountain group. It is a place of pilgrimage which has been frequented for many centuries. It is a very large and striking building enclosing a church, some parts of which are very ancient. The valley, buried in the hills, is surrounded by the most beautiful woods of beech and oak. Higher up are pines, and higher still pastures and savage crags. A more beautiful and striking scene is hardly to be found in all Europe than the glen of Rilo; and if any of you should find yourselves at Sofia, I would strongly recommend you to spend three days in making an excursion to a place so full of historical interest, as well as of picturesque charm. It is a remarkable thing that this great mountain range is not a race boundary. The Bulgarian population exists on both the north and the south of it. You do not get the Greek-speaking population until you come much further south—in fact, pretty near to the coast. The Pomaks are an interesting people. I see Colonel Maunsell adopts the view, which has been generally received, that they are Bulgarians by race, who were long ago converted to Islam, but I believe some other views have been entertained. The Kutzo Vlachs are also a remarkable race. They speak a language very nearly the same as the Russian of Wallachia and Moldavia and Transylvania. They have been hitherto classed as adherents to the Orthodox Eastern (or, as we call it, Greek) Church, but of late years they have taken to assert an ecclesiastical independence for themselves, and have thereby incurred the hostility of the Greek population, whose armed bands now make frequent raids upon them. Much trouble has thereby arisen between the Government of Rumania and that of Greece. I have observed that this great mountain mass of Rhodope, difficult of passage as it is, has nevertheless not been a political boundary. Apparently when the Bulgarians, a Finnish race from the Volga, came into the country, which is now called by their name, in the eighth or ninth century, they met with comparatively little opposition, and soon spread themselves over both sides of the chain, till they got in some places to within 40 or 50 miles of Constantinople. It is a momentous feature in the

present political situation that the Bulgarian population, being the same on both sides of the chain, is in close relationship each part with the other. The Bulgarians north of Rhodope sympathize with those who live south of it under the Turkish sceptre, and that is, of course, one of the causes that makes the existing situation full of peril, because the Bulgarians who enjoy freedom cannot but sympathize with their brethren who live to the south of the mountains under those deplorable conditions which are known to all of us. There is very little more that my limited knowledge enables me to say, except that the scenery of these western Rhodope mountains is exceedingly noble. Their highest summit is, I think, the loftiest summit in the whole Balkan peninsula, *i.e.* between the Adriatic and the Euxine, with the exception probably of Olympus, whose majestic peak very nearly touches 10,000 feet. There may, in northern Albania, be summits equally lofty—very few have been accurately measured—but with that exception Musalla probably overtops everything except Olympus.

Mr. Hogarth: I am afraid I have not much claim to make remarks upon the singularly interesting and careful paper which Colonel Maunsell has read. It is curious that it should supply almost the only detailed authority we have upon a group of mountains which is so accessible, and which a great many of us have seen more than once in travelling by train. I cannot, however, echo the famous remark of the Oxford don, "I know nothing about this subject, I have not even written a book about it," as I have, much against my will, dealt with these mountains in a general account of the country. The only thing I shall do to-night is to take measures to learn a little more, if Colonel Maunsell will answer one or two questions I should like to ask him. First of all, is it a fact that Dospat Dagh is a genuine native name? and is the name, Despóto Dagh, which the Greeks give the mountain, merely a corruption of that? The mountain may have been so called from the proximity of the great Rilo monastery. The other question I should like to ask is with regard to the Pomaks. As Mr. Bryce has said, there is an alternative view to that expressed by Colonel Maunsell, that they are Bulgarians by race. That view is that they are a remnant of the original Thracians driven up into the mountains. A good deal depends on the language they speak. But the types which Colonel Maunsell put upon the screen do not recall to my mind Bulgarian types, still less do they recall Turkish types or Greek types. That fact seems to me to lend some weight to the theory that these Pomaks are a remnant of a more or less aboriginal Thracian race driven up into the mountains by the Greek incursion from the south, and by the Bulgarian incursion from the north. It is very interesting to find these people in the Dere Bey stage. That is a stage through which most of Turkey has passed. I do not know whether Colonel Maunsell learnt anything as to the origin of the power which these Dere Beys exercised. In Asia Minor they generally seem to have had two sources of power. In certain cases it rested on a tribal basis, for it so happens that the heads of the two greatest Anatolian families were both Turkoman Beys. But in other cases they got their power by contracting to collect the taxes of a certain region. As time went on, their sense of their obligation in collecting the taxes very often ceased with the collection. I should like to know whether there is any evidence to show how these Dere Beys of the Rhodope came by their power—that is to say, whether they are comparatively modern, or are feudal chiefs dependent upon ancient family and tribal connections. As to the nomad people, I am afraid I do not know what the Kachan part of their name, Kara Kachan, means; but, judging by the place from which they are said to have come, they would seem to be the same as the "Karagounis" of the S. Pindus, who are not properly Kutzovlachs at all. The latter might, indeed, call themselves so now,

but they speak a quite recognizable dialect of Greek, and not a Rouman dialect. They are a curious nomadic people whose time is entirely taken up in conveying goods for other people, and very often stealing them. They became well known to people who were about in Greece in 1897, as they were among those who fled most freely from the Turks to Athens. "Karagouni" means, in their language, "black cloak." I do not know whether Kara Kachan may have the same sense. I think Mr. Bryce was wrong about the Pindus summits. So far as I know, there is no summit in the Pindus which exceeds 8000 feet, if there are any which touch it. But I am perfectly certain that Rhodope is higher by a good thousand feet than Pindus. If Musalla is actually the highest peak, I do not know.

Mr. Bryce: Musalla is the highest.

Mr. Hogarth: The only other point on which I should like information is whether Colonel Maunsell asked any questions about religious survivals in the Rhodope; that is to say, whether there is any trace, if this is a Bulgarian population, of those curious dualistic faiths which seem to have flourished both in the plain immediately north of the Rhodope, and also further west about Philippopolis. In the latter district they were apparently due to Armenians imported from the upper Euphrates. But, at the same time, dualism seems to be too widely spread in Bulgaria to be due simply to immigrants.

Mr. Noel Buxton: I feel it rather difficult to keep the admirable rule of this Society that nothing must be said which has any reference to politics, because even Colonel Maunsell's paper, which has so strictly kept the rule, alludes to the habits of the people, and the habits of the people are hardly separable in this case from the peculiar governments which have led to those habits. Now, he spoke more than once of the denuded state of these mountains, and what has struck me very much is that you find on one side of the mountains under one Government the forest mostly gone, on the other side you find the forests carefully managed. You find, again, with regard to the housing of the people, that on the Bulgarian side, so far from some degree of civilized methods having made the villages less picturesque, the greater security that prevails there has made them much more picturesque. You find quite a different stamp of house. You find the tiles, for instance, better; you find the eaves wider; and, strangely enough, contrary to our usual experience, greater civilization makes things much more picturesque than before. Then there is rather a curious thing with regard to the fauna. A European who lives in the middle of Macedonia was telling me the other day that one curious result of the disturbances in that country was the great increase of big game. The farms having been inaccessible during recent summers, there has been a great increase, he told me, of red deer and also of bears. Colonel Maunsell was saying it was a difficult thing to organize these hunts. I took part myself in one very picturesque bear hunt in another range, and, as he said, it required a great army of beaters. The beaters were armed with old kerosene-tins, and certainly the noise they made was enough to move any beast. My host gave orders that if any beater had not set out for the forest by four o'clock in the morning, he should be flogged. I am not able to speak of any part of the Rhodope range except a little further east than Mr. Bryce spoke of—on the north of the range, on the Bulgarian side. I think the world will some day wonder why this country was not earlier discovered as a tourist country. Mr. Bryce spoke of the extreme beauty of some parts of the country on the other side. That on the north side has another beauty, and a very remarkable one. I am quite sure I have not seen autumn colours of such extraordinary vividness as they are there. The whole of the hillside is often made up of the most brilliant wild cherry, and again of the wild pear, and you have now and again a pear tree covered with a wild vine in different shades of

blazing scarlet, and certainly the effect is very wonderful. Then you get the most extraordinary variety of country in that part of the world. There is a place where the Prince of Bulgaria established a summer villa, and I find I made a note that one of the views gave me an impression of a sort of magnified Hindhead, and a great deal of the country round about there reminded me strongly of the Haslemere district of Surrey, only on a grander scale. Then, again, you get Scotch scenery, and these extraordinary varieties not very far apart. At Cham Kuria there is a fish hatchery and an experimental farm, and a good many pines have been introduced. The Macedonian pine is extremely fine on the north side of the Rhodope, but on the south it has been very largely destroyed. That again brings you inevitably in touch with the Government of the country, because it was very largely destroyed in some of the districts only two years ago in order to make it impossible for refugees to hide on the mountain-side, and I remember that Prince Ferdinand appeared to be deeply moved by the loss of these forests of *Pinus Macedonica*, which is limited to a rather small area, and was destroyed in enormous quantities at that time. As to the people, I speak very much as an amateur, but I would like to throw out one piece of information which may possibly throw light on the difficult questions raised by Mr. Hogarth. It struck me as a very astonishing thing, when I first went among the Pomaks, to see the Mohammedan cast of countenance and their peculiar aggressive expression combined with blue eyes, but I did not see the same blue eyes among the Bulgarians proper, and I do not know whether that indicates any sort of difference such as Mr. Hogarth seems to lean to. The Pomaks are very remarkable, because they appear to me to be on the north side a great deal more prosperous than those in Turkey. They also seem to me to have a more jovial nature than the Christian Bulgarians, and I do not know that that is likely to be introduced by their religion. It occurred to me that they are of a different stamp from the Christian Bulgarians. I do not wish to take up more time, but I cannot help saying that I think this part of the world has been marvellously neglected as a country for travel. You have a country where practically you may be quite certain you will not meet another tourist, and you have a country of great natural beauty within two or three days' journey of London. You get right away from the railway in three days, and in the very limits of an ordinary holiday you can get a full month in an extremely interesting and unknown part of the world. You can get valleys undefiled by the motor, and mountains unvulgarized by the modern hotel.

The PRESIDENT: I rise to propose a vote of thanks to Colonel Maunsell. I have no doubt you will join in the vote very heartily.

Colonel MAUNSELL: As regards the height of the various ranges, the Rilo Dagh is undoubtedly the highest mountain, and the Musalla peak at its south-eastern end its loftiest summit. I think Mount Olympus rises to nearly 10,000 feet, and some of the northern Albanian mountains reach to about 9000 feet; but they have never been thoroughly explored or measured. The name of Dospat Dagh comes, apparently, from the village, and there is no trace of a monastery near by, while the village is Mohammedan. As regards the origin of the Pomaks, I am afraid I cannot agree that they are separate from the Bulgarian race. So far as I could see, comparing them with the Christian Bulgarians in the same valley, the type looked precisely the same, and I think one may say that they are the same race. As regards the "Derebeys," I do not think there ever was any tribal organization in that country; no trace exists now, and I do not think they derive that power from tribal power. Probably the country was divided into natural valleys, and each valley had a leader of its own, as the name "Derebey," which means "lord of the valley," suggests. There may have been tax-farmers in later

days, but I think they are simply the biggest men in the valley. As regards the name Kara Kachan, I asked the Turks what was the derivation, and they told me that Kara Kachan meant really "Kir Kachan," or people who have fled into the mountains. They were regarded as traitors in Albania, and fled to the mountains, hence the name "the flyers into the open," which has now become corrupted into Kara Kachan. In origin I should think they are southern Albanians who became detached after the death of Ali Pasha owing to their treachery, and they are wrongly called Kutzo Vlachs. As regards old religious survivals or rites, I could not trace anything such as can be found among the Kizilbash of Asia Minor, who are Moslems outwardly, but practising in secret many ancient ceremonies derived from paganism.

RECENT CHANGE OF LEVEL IN ALASKA.*

By RALPH S. TARR and LAWRENCE MARTIN.

WHILE it is well known that mountains are formed by uplift, involving folding and faulting, and while evidences of past movement are numerous, and uplifts have been actually observed, it is rare that the evidence of the growth of mountains is capable of clear demonstration upon the basis of observation. It is from this standpoint, as well as from the standpoint of the remarkable changes recorded below, that this article is believed to present points of interest to the geographer as well as to the geologist. In this Alaskan instance the formation of one of the grandest features of the Earth is seen to be in progress to-day—a geographical development under our very eyes.

The Mount St. Elias chain extends along the boundary-line between Canada and Alaska, rearing its snow-clad peaks to elevations of 10,000 to 15,000 feet, and culminating in Mount St. Elias (18,024 feet) on the International boundary, and Mount Logan (19,539 feet) in Canada, the second and third highest peaks on the North American continent. This mountain range, like others in Western America, is young, and, as was shown by Prof. I. C. Russell, bears distinct evidence of recent growth and uplift. Its peaks are high and rugged; the mountain spurs show an alignment suggestive of fault origin; and some of the individual mountains, including Mount St. Elias, have the appearance of tilted fault-blocks. From the higher mountain peaks and mountain valleys great glaciers descend, some of them reaching the sea. Several of the

* The observations recorded in this paper were made in the summer of 1905, in connection with a general geological survey of the Yakutat bay region by a U.S. Geological Survey party under the direction of the senior author. A grant of money from the American Geographical Society made it possible to add the junior author to the party as special assistant in glacial geology and physiography. Acknowledgments are due to B. S. Butler, the other member of the scientific corps, for assistance in this work. A more detailed statement of our observations on this change of level will appear in vol. 17 of the *Bulletin of the Geological Society of America*, and our complete final report in a Professional Paper of the United States Geological Survey.

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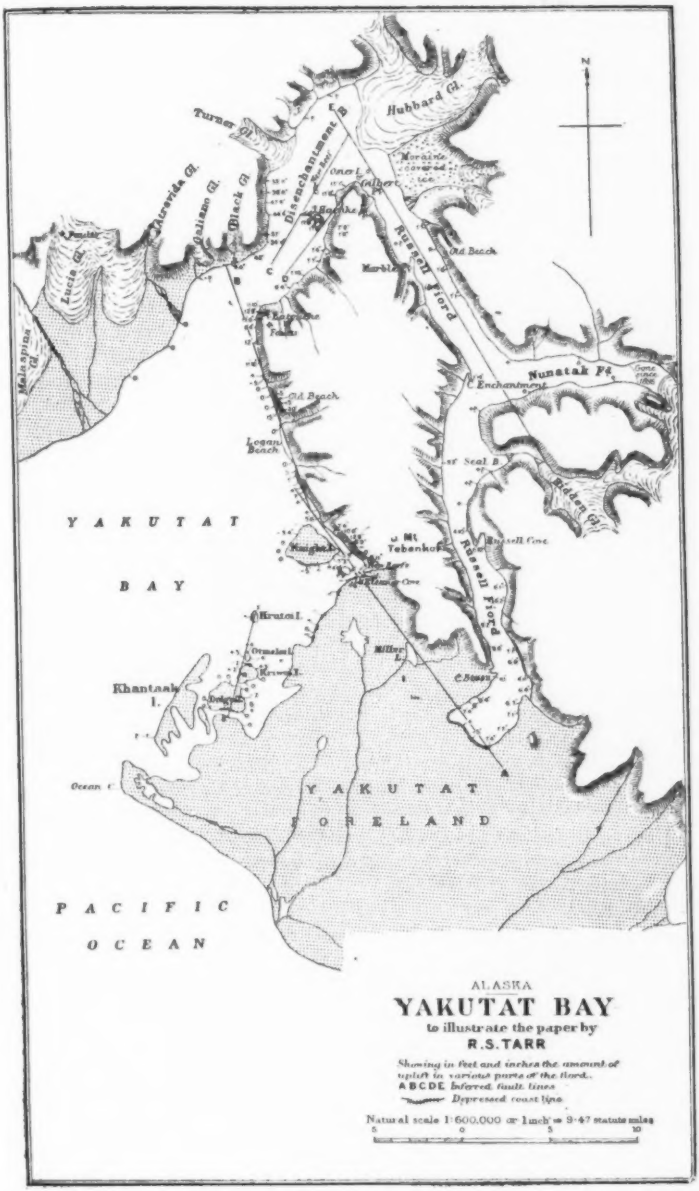

N
Hubbard Gl.
Turner Gl.
Disenchantment B.
Russell Fiord
Old Beach
Nunatak Ft.
Enchantment
Seal B.
Redden Gl.
Lucia Gl.
Black Gl.
Malaspina Gl.
Logan Beach
YAKUTAT
BAY
Mt Tebenkof
Russell Cove
Hrutal I.
Khantaak I.
Ocean C.
YAKUTAT
FORELAND
PACIFIC
OCEAN
ALASKA
YAKUTAT BAY
to illustrate the paper by
R.S.TARR
Showing in feet and inches the amount of uplift in various parts of the fiord.
ABCDE Inferred fault lines
Depressed coast line
Natural scale 1:600,000 or 1 inch = 9·47 statute miles
5 0 5 10

FIG. 1.

largest of these glaciers coalesce near the base of Mount St. Elias to form the great Piedmont ice-plateau to which the name Malaspina glacier is given. At an earlier period of greater ice expansion other large glaciers coalesced at the mountain base south-east of the Malaspina glacier, and by their moraines and outwash gravel deposits built up an extensive coastal plain, or foreland, which now fringes the mountain base (Fig. 1).

The straight mountain front and its fringing foreland have given to this part of the Alaskan coast a remarkably smooth outline, quite in contrast to the fiorded coast-line both to the south-east and north-west. This straight stretch of coast, which extends for a distance of

FIG. 2.—WAVE-CUT BENCH, 18 FEET ABOVE PRESENT HIGH TIDE, ON DISENCHANTMENT BAY, NEAR HAENKE ISLAND. BARNACLES AND MUSSELS OCCUR IN PLACES ON THIS BENCH AMID THE SCATTERED ANNUAL PLANTS AND YOUNG BUSHES. THE OLDER GROWTH OF ALDERS IS SEEN IN THE UPPER RIGHT-HAND CORNER.

about 300 miles, is broken by only one inlet of notable size. At its mouth, where it is broad and V-shaped, this inlet is called Yakutat bay. Here it is bordered on the eastern side for half its length by the low foreland, and on the western side by the Malaspina glacier and its fringe of outwash deposits. Narrowing toward the head of the bay, the inlet penetrates the St. Elias chain, then turns abruptly back toward the ocean, reaching beyond the mountain front at its head, and terminating in the low foreland. The entire inlet has the form of a bent arm, with the shoulder at the ocean and the fist at its head. Where the inlet enters the mountains the name is changed to Disenchantment bay up to the bend, and beyond this it is called Russell

fiord (Fig. 1). The mountain-walled portion of the inlet is a true fiord with mountains rising abruptly from 3000 to 5000 feet, and at the elbow to elevations of 10,000 to 16,000 feet. The total length of the Yakutat bay inlet from the sea to the head of Russell fiord is from 70 to 75 miles.

The geological formations differ from place to place. Both the mouth of the inlet and its head beyond the mountain front are bordered by recent deposits of glacial origin. The mountains which the inlet cuts are mostly made of a very complexly folded and faulted system of shales, volcanic tuff, and other rocks of undetermined age, to which the name Yakutat Series has been applied. Crystalline rocks, also of undetermined age, form the core of the Mount St. Elias range, and border the northern shore of the north-western arm of Russell fiord, the two series being separated by a fault-line (Fig. 1).

In the summer of 1905 our United States Geological Survey party spent somewhat more than two months in this inlet studying the general geology and physical geography of the region. Our studies extended along a coast of about 150 miles in extent, on which there was clear evidence of a recent and remarkable change of level. This evidence is of three classes—physiographic, biological, and human testimony.

The most pronounced physiographical evidence of change of level is that presented by well-defined rock benches and associated sea-

FIG. 3.—ELEVATED BENCH, 35 FEET ABOVE PRESENT HIGH TIDE, NORTH OF POINT FUNSTON.

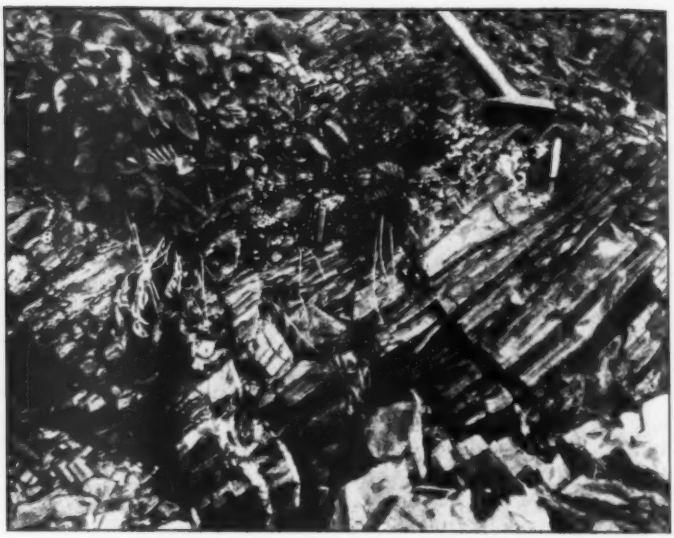


FIG. 4.—BARNACLES CLINGING TO SLATE ROCK (NEAR KNIFE AND CARTRIDGES), 7 FEET ABOVE PRESENT HIGH TIDE. YOUNG ALDERS HAVE THEIR ROOTS IN CREVICES AT SAME ELEVATION. PHOTOGRAPH TAKEN OPPOSITE MARBLE POINT.

caves and chasms elevated well above the level of the present reach of the highest waves. So pronounced are these uplifted strands that it was possible to photograph them at numerous points (Fig. 2), and in places they furnished excellent highways for travel along the coast at points where the steeply rising shore presented no foothold at the present wave-line. The strength of development of the benches cut in the rock and of the connecting beaches (Fig. 3) proves conclusively that the land had remained at the lower level for some time before the uplift. Wave-work in the narrow fiord is not at present very rapid, but the effect of iceberg waves during a period of recent ice advance, of which there is abundant evidence, no doubt in part accounts for the strength of development of the uplifted beaches and wave-cut benches.

Associated with the elevated beaches are numerous uplifted alluvial fans into which the streams have now cut small gorges, and on the front of which the fiord waves have cut low cliffs. Besides these physiographic evidences of change of level, new reefs have appeared at two points in the inlet (Fig. 1).

The biological evidence of uplift is striking. All around those parts of the inlet where the land has been raised, remains of marine animals are abundant up to the level of the elevated strand. Most of these forms of life are loose, and by themselves might not be

FIG. 5.—BRYOZOAN REMAINS (WHITE) ON THE ELEVATED STRAND. ALONG THE CREVICES OF THE ROCK MUSSEL SHELLS ARE CLINGING, AND YOUNG ALDER BUSHES HAVE TAKEN ROOT AMONG THEM. PHOTOGRAPH TAKEN ON COAST NORTH OF POINT FUNSTON.

FIG. 6.—DEPRESSED COAST ON THE SOUTHERN SHORE OF KNIGHT ISLAND, SHOWING ENCROACHMENT OF BEACH IN THE FOREST.

considered proof of recent change of level; but several species were commonly found in place. Of these the most abundant were the barnacles (*Ballanus cariosus* and *Ballanus porcatus*), which were found throughout the fiord, clinging to the uplifted ledges and benches where they grew (Fig. 4). Shells of the common mussel (*Mytilus edulis*) were also found on the abandoned strands, and in such abundance as to present the appearance of patches of blue flowers when viewed from a short distance. Most commonly these shells were unattached, but at numerous points they were found still adhering by their byssus to the ledges (Fig. 5). A bryozoan, which grows below low-tide line, was also found clinging to the rocks well above the reach of the present waves, forming a whitened coating, which gave to the rock-surface a whitewashed appearance when viewed from a distance (Fig. 5). Still another evidence of uplift was presented by the parallel lines of drift-wood, one line at present high-water mark, another at the crest of the abandoned strand.

While uplift is recorded throughout most of the inlet, there is clear evidence of depression in some sections, notably on the foreland just outside the mountain front (Fig. 1). This evidence is less complex than that of the uplift, but is no less convincing. It consists of the presence of salt water in the forest which borders portions of the depressed coast-line, and into which sand and beach gravel are now being thrown by the waves (Fig. 6). Where the waves have reached most effectively the trees have been killed and often thrown down; but back of this is a zone in which the destruction of the land plants has not yet been completed.

One of the most important features connected with these changes of level is the clear evidence of their recency. As has just been stated, the depression is so recent that destruction of those trees which only the highest waves reach is not yet complete. Where the change of level is one of uplift there are numerous evidences of its recency. Along the present wave-zone the work of the waves has not only been unable to cut a new bench, even in the weaker rocks, but in places where the rocks are fairly resistant fresh glacial grooves, striæ, and polishing still remain in the zone of wave attack. Furthermore, in a number of places the uplift has brought till deposits into the wave zone, and the erosion has not yet succeeded in removing the clay and concentrating the pebbles. In consequence of this we have the anomaly of a clay shore against which the waves are breaking, giving rise to a strip of muddy water along the coast. That the uplift is of recent date is also proved by the fact that marine animals still cling to the rock on which they were adhering during their life. Even the byssus of the mussel is still preserved, and in many places the organic tissue of the barnacles causes their valves to remain in position.

Even more striking than this evidence is the barrenness of the

FIG. 7.—WAVE-SWEPT AREA, SHOWING DEVASTATION CAUSED BY EARTHQUAKE WATER-WAVE UP TO LEVEL OF 40 FEET. COAST NORTH OF LOGAN BEACH.

FIG. 8.—SOME OF THE PARALLEL MINOR FAULT-LINES ON GANNETT NUNATAK.

elevated zone (Figs. 2 and 3). While mature willow and alder bushes grow above the abandoned strand, the elevated beaches and benches support only scattered annual plants and occasional young alders and willows (Figs. 4 and 5). Many of these bushes were cut down and the rings of annual growth counted; but in no case was one found on the raised shore-line with more than five rings, while most of them had but three or four. This fact points quite clearly to the season of 1899 as the time of uplift.

Bearing upon this point of the exact period of change of level is the human testimony. In the first place, Prof. I. C. Russell spent some time in this fiord in 1890 and 1891, and he reports no change of level. Dr. G. K. Gilbert spent several days in the Yakutat bay inlet in June, 1899, landing at several points in the fiord; in one place on a coast where the uplift amounts to 18 feet. Moreover, the ship in which he travelled sailed twice close by one of the new uncharted reefs, which could hardly have escaped the attention of sailors. Both Prof. Russell and Dr. Gilbert have made a special study of abandoned shore-lines, and it is inconceivable that these geographers could have failed to observe the uplift if it had existed during their visit. A photograph taken by a United States Fish Commission expedition in July, 1901, shows clearly the presence at that time of an uplifted bench at one point (Haenke island) in the inlet.

The testimony of natives is definite as to the time of occurrence of the change of level. Every spring they spend two months or more in the inlet hunting the hair seal, so that they are familiar with the region in detail. They assert positively that the uplift occurred in September, 1899, during a series of earthquake shocks which lasted for seventeen days.

Of the occurrence of this earthquake there is unquestioned proof. Entirely aside from the testimony of the natives, there were three prospectors encamped on the shores of the inlet during the heaviest of the shocks; and at the village of Yakutat, at the mouth of the bay, there are a number of white men whose account tallies with that of the natives and of the prospectors. The shocks began on September 3 and ceased on the 20th, reaching greatest intensity September 10 and 15. On September 10, between 9.20 a.m. and 3 p.m., there were fifty-two notable shocks, culminating in one of great violence. The prospectors report a great water-wave in the fiord during the most vigorous shocks; and the inhabitants of Yakutat, 15 or 20 miles away from the centre of greatest disturbance, were so alarmed by the shaking that they abandoned their houses and retreated to tents on the neighbouring hills.

Signs of the earthquake are still visible at various points in the inlet. In the first place, the mountain slopes are scarred with great avalanches, far more numerous than in other fiords on the Alaskan

coast. In the second place, there are wave-swept areas (Fig. 7), in two sections reaching to an elevation of 40 feet above sea-level, throughout which the forest is completely destroyed. Here trees are overturned, twisted, broken, and uprooted, giving rise to such a scene of devastation as only rushing water could produce.

In this sparsely settled region it is natural that the extent of the earthquake should not be exactly known. That it was not confined to this limited area is probable; and in this connection it is noteworthy that in September, 1899, an earthquake of great violence occurred in Glacier bay, 135 miles from Yakutat bay. This earthquake was so

FIG. 9.—ONE OF THE MINOR FAULT SCARPS ON GANNETT NUNATAK.

violent that it shattered the front of the Muir glacier to such an extent that for several years the tourist steamer was not able to penetrate the bay to the Muir glacier. In all probability the uplift which accompanied this shock affected the entire region between Yakutat and Glacier bays, and doubtless for a considerable distance beyond this area. As yet, however, no evidence of change of level has been reported outside of Yakutat bay.

In connection with our other studies, we made measurements of the amount of change of level at various points along the 150 miles of coast-line which we visited, making in all over one hundred careful measurements, besides numerous observations for checking these. The numerical results of these observations are plotted on the accompanying map (Fig. 1). From this map it will be seen that the amount of

uplift varies greatly from place to place. One of the most noteworthy features on the map is that there is a zone just outside the mountain front, on one side of which there is uplift, and on the other side, in general, either no change of level or else a depression. This is true at the head of the inlet and on both shores of Yakutat bay. From this and other facts it is inferred that a fault-line extends here as indicated by the line A. The very variable amount of change of level along this line is believed to be the result of a drag along the fault. It should be stated that the straight mountain front which rises above the foreland close by this inferred fault was interpreted by Russell as a fault scarp in 1890 on the basis of its form alone. We reached the same conclusion when we first saw this mountain front, and before we knew of the recent change of level.

The complex condition of change of level in the archipelago of islands north of Yakutat Cannery and Mission may in part be due to a shaking of the gravels of which these islands are made; but this would not account for the uplifted sections. We have, therefore, inferred a minor fault along the axis of these islands; but the evidence of this fault-line is less definite than that of the others.

On the basis of its form, Prof. Russell also classed the straight mountain front along the eastern shore of Yakutat bay as a fault scarp; and here again our evidence tends to verify his interpretation. The evidence of faulting along this line, which we have indicated by the letter B, is of several kinds. In the first place, the straight, steep, truncated mountain spurs are suggestive of fault origin. In the second place, there is an unusual abundance of avalanches along this mountain front. In the third place, the change of level along this line varies greatly, as would be expected along a line of faulting with updragging of the strata on the downthrow side. In the fourth place, at one point (marked Old Beach) there is a still earlier uplifted strand on which a mature forest is now growing, with trees over seventy-five years old, proving a former period of uplift.

Along the shores of Disenchantment bay there are great differences in the amount of uplift. Throughout the greater part of the eastern shore the uplift is between 7 and 9 feet. On Haenke island and on the peninsula just north-east of it, the uplift ranges from 17 feet to 19 feet 3 inches. On the western shore of Disenchantment bay the uplift varies from 33 feet 11 inches to 47 feet 4 inches, the latter being the greatest change of level in the inlet, and, in fact, the greatest uplift ever recorded as having occurred at a single period of time. To account for the difference in level of the upraised strand in Disenchantment bay, we have inferred two fault-lines (C and D), as indicated on the map.

Along the north-west arm of Russell fiord the south-west shore shows very slight uplift, while the north-east shore is raised from

7 feet 6 inches to 9 feet. Moreover, along the north-east shore there is an older beach covered by a growth of mature alders. This shore of the fiord is made of crystalline rocks, while the younger Yakutat series forms the south-west shore. Geological evidence proves the presence of a fault-line between the Nunatak fiord and the valley of Hidden glacier, which, extended, would pass along the axis of the north-west arm of Russell fiord, where, from the evidence of the upraised shore-lines, we have inferred fault E.

From the region of slight uplift in lower Russell fiord there is a gradual rise of the abandoned strand toward the mountain front, where it reaches a maximum of 9 to 10 feet.

In inferring our fault-lines we have endeavoured to be conservative, and to postulate no more than the evidence definitely calls for. Our studies, however, prove conclusively that there was pronounced dislocation in other parts of the region. At several points we found small recent faults. These were best shown on the Gannett Nunatak, at the head of Nunatak fiord, and a description of these may serve for the rest. This nunatak is a glaciated rock hill rising about 1450 feet above the fiord, and composed of steeply dipping gneisses and schists, striking approximately parallel to the major axis of the St. Elias chain—that is, north-westward. In its southern half it is crossed by scores of small faults extending from a few feet to over 100 yards, and with throws varying from an inch to 3 feet, but usually of less than a foot (Figs. 8 and 9). They generally extend along the strike of the rock, but in some instances diverge from it, and a few short faults strike at right angles to the main series. The hade is nearly vertical, and in almost all cases the south-western side of the fault is the upthrow side. There are also some fissures, and a few instances of small graben blocks (from 3 to 30 feet wide) between parallel faults.

While it cannot be demonstrated that these minor faults were formed at the same period as the uplifted strands, this inference is nevertheless apparently warranted, for the faults are evidently very recent, and no other notable earthquakes have recently occurred here. The fault scarps are steep, and in many instances have striæ extending up to their very edges. Their recency is proved by the sharp angle formed where the fault-plane intersects the surface, and by the absence of notable talus slopes at the base of most of the tiny fault-scarps, even though the rocks are friable, thin-bedded schists. It seems incredible that these fault-scarps can have been exposed to the sharp frost-action of this climate longer than six years.

From our observations we draw the conclusion that this part of the St. Elias chain is still actively growing, and that this growth is being accomplished by movements along a series of fault-lines by which several mountain blocks are being differentially uplifted, as first suggested by Prof. Russell. At least one period of earlier uplift is

demonstrated by the presence of the older forest-covered beaches; but a much more notable mountain growth occurred in September, 1899. This uplift involved the entire mountain region inside of the Yakutat foreland as far as the bay reaches, and to an unknown distance beyond. It consisted of a general uplift along the mountain front, and of a differential uplift along several secondary lines of faulting: in other words, the mountains are tilted in a series of fault blocks. In addition to these major lines of faulting there was a minor fracturing, apparently due to local adjustments in the tilted blocks.

This recent change of level is noteworthy from three standpoints: Its age can be definitely determined; it is the greatest uplift so far recorded as having occurred at a given time; it contains a lesson of importance as to the mode of formation of mountains, representing as it does a step in the development of the loftiest range on the American continent.

ADDENDUM.—The San Francisco Earthquake of April 18.

Since this article was written, and just as it is being made ready for mailing (April 19), news comes of the terribly destructive earthquake which has caused such devastation in California. While as yet the meagre dispatches give us little information of scientific value regarding this most recent of vigorous earthquakes, enough is known, both from the past history of California and from the newspaper accounts of the present shock, to make it certain that the conditions described above are distinctly applicable to the San Francisco earthquake. American geologists have long been familiar with the fact that the Coast Ranges of California, like the mountains of Alaska, are still in the process of evolution. The frequent earthquakes which have been felt in California, numbering from one to three score a year, are proof of this. Geological study demonstrates that the rocks of the Coast Ranges are crossed by many fault-lines; and physiographic investigations have shown that recent earth-movements have upraised parts of the Californian coast and depressed others, including the bay of San Francisco, which is the drowned mouth of the Sacramento river, into which the sea has been admitted by local subsidence.

Where the fault-lines along which the slipping occurred to cause the San Francisco earthquake are located, whether there is but one line of slipping or several—as in Yakutat bay—and whether the movements have produced visible signs of uplift or depression, as in Alaska, are questions which future investigation must answer. It seems evident, however, that the shock is the result of a normal process of mountain-building here as in Alaska. The strains to which the mountain rocks are subjected have locally become too great, and relief has been gained by a slipping of the rocks over one another —probably on one or more planes of older faulting, along which previous

movements have occurred. San Francisco is situated on a danger-line in the Earth's crust, and it will remain in danger so long as the growth of the Coast Ranges continues. Many years may elapse before the strain again reaches the condition necessitating vigorous movement and consequent destructive earth-shaking. It is to be hoped that the interval will be a long one in this place, where other geographical conditions have determined that a large city must develop.

THE SNOW-PEAKS OF RUWENZORI.

Their Probable Positions and Heights.

By Lieut. T. T. BEHRENS, R.E.

In the following note an attempt has been made to combine the available data from all sources, and to obtain the best and most probable positions and heights for the main snow-peaks of Ruwenzori. It is a pity that in cases of this kind, where each traveller's observations are necessarily insufficient to give a definite result, few give their observations in published form in such a manner that others who come after them can combine them with their own work. The mere publication of a map is, of course, of no use to the cartographer unless he knows on what kind of observations the positions of the points depend.

I say that a single traveller's observations were "necessarily insufficient;" and when I say that, though in a neighbourhood for nine months from which, on most days, Ruwenzori might have been visible from my tent, I only saw it seven times, and then only for a few moments just after sunrise, the difficulty of observing the mountain will be apparent. So fleeting were the chances of observing, between the time when it was light enough to see and when the clouds covered the peaks in rising mist, that I only once had time to sketch the range, and once again to observe all the five peaks visible. On the other five occasions there was only time to observe the two highest points, while many a time, when the instrument had been placed in position and the telescope directed to the mountain, it was only to see the first cloud covering the coveted pinnacles. And all this, in spite of a daily watch being kept at dawn to apprise me of even the possibility of seeing the mountain.

In the present instance the data available are the following, in the order of accuracy:—

1. Two tops of a summit fixed trigonometrically.
2. Trigonometrical rays to four other summits.
3. Eight perspective views from sketches or photographs, with some magnetic bearings and variation of the compass determinations.
4. A map compiled from all available sources up to 1901, chiefly

RUWENZORI SNOW PEAKS

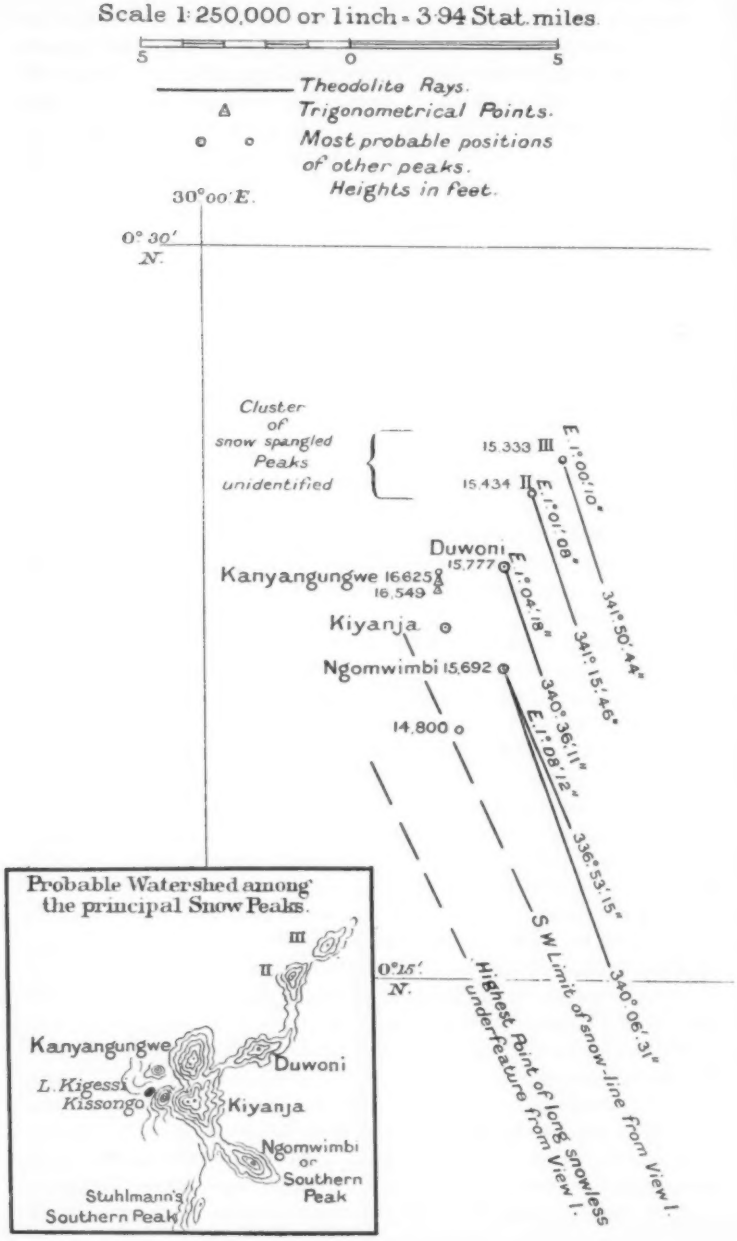


FIG. 1.

based on Dr. Stuhlmann's route traverses and astronomical observations.

5. Information received this week from Mr. A. F. R. Wollaston, and kindly put at my disposal by Mr. Douglas Freshfield, which materially helped in arriving at a conjecture of the probable shape of the watershed between the peaks. Mr. Wollaston had been up Duwoni and Kiyanja, besides climbing to a point on the watershed between them. The outline given of the ridges tallies very well with all the best data, although it does not satisfy some of the less reliable. Mr. Freshfield very kindly helped me by his personal knowledge of the mountain.

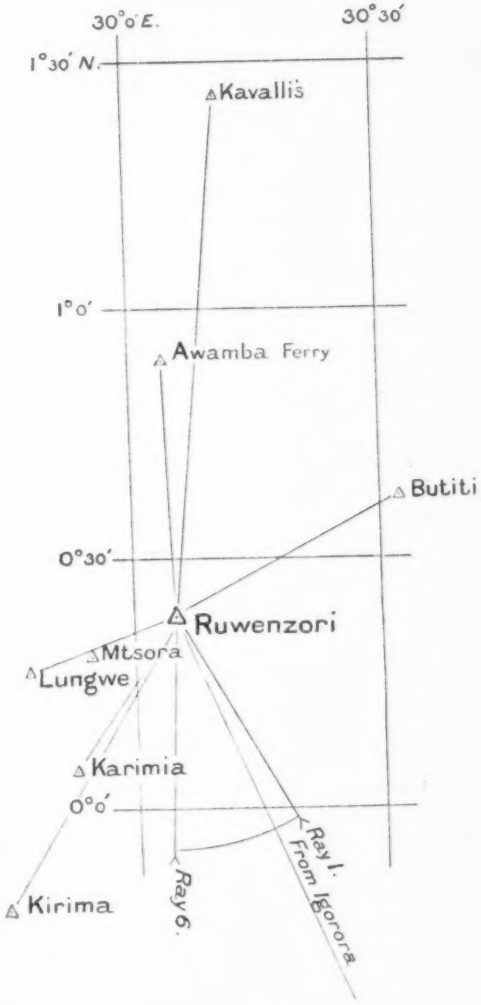


FIG. 2.

It was very satisfactory to find that the result also coincides with Dr. Stuhlmann's careful description of the ridges seen from his highest camp 13,330 feet on the western slopes. The positions of the peaks satisfy his compass bearings from Kirima and Lungwe, while Mr. Wollaston's height for Duwoni agrees very well with the 15,777 feet given by the Boundary Commission calculations, which make Lake Albert Edward 3010 feet. It is noteworthy that neither Dr. Stuhlmann on the west and north-west, nor Mr. Douglas Freshfield on the east and north-east, of the mountain saw

any snow-peak away to the north of this group of peaks, though Mr. Wollaston now speaks of having seen what he believes will prove to be the highest peak "a good many miles due north of Kiyanja," on which he was standing.

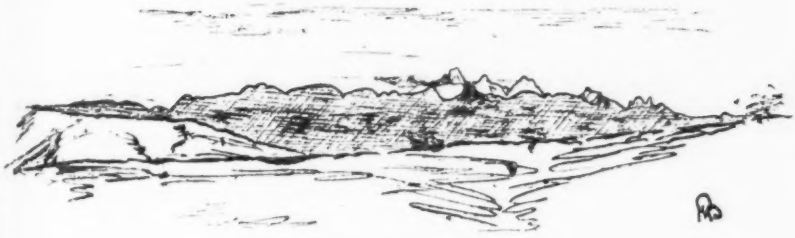
1. Two peaks, close together, fixed by six and five rays each from the main trigonometrical stations of the Anglo-German Boundary Survey, 1903. The six rays to the main peak all passed through a circle of radius 9 feet, and those to the lower point through one of radius 12 feet. The six height determinations for each had a range of 72 feet. The coefficient of refraction used was one determined at the same time of day as the observations to Ruwenzori (early morning) by a large number of simultaneous observations, between two distant hills, on several different days. A more probable value for the refraction was got in this way than by taking an arbitrary value, found for the time of day when the vertical angles for the ordinary work were usually observed. The heights given for these summits may be considered correct within ± 30 feet at the most.

2. Two rays observed to a third point, and three single rays, one to each of three other snow-capped peaks. The rays to these four subsidiary points have been drawn in their correct places in Fig. 1, and against each has been written the correct reverse azimuth at the point. The two well-fixed points have been shown in the same figure in their calculated positions. The lower point is 655 feet south of, 256 feet to the west of, and 76 feet lower than, the main and more northern summit. The longitude is the same as that in the Hamburg Society's map.

It is to be hoped that any other traveller's unpublished observations may now be made accessible, so that the true positions of the other peaks may be more certainly fixed. The word "probable" positions is advisedly used, as it is with great diffidence that an attempt is put forward to solve the problem with such insufficient data.

3. Eight views, from the sketches and photos of various travellers, have been collected as a basis on which to judge of the probability of the positions assigned to the several summits. These were all that could be used, as only those taken from points whose positions with reference to the mountain were more accurately known would be of any use. Fig. 2 shows the points from which these views were taken, and the sector between ray 1 and ray 6 is that within which the rays determining the main point lie.

Referring again to the sketches (Fig. 3), No. 1 was sketched at a point 80 miles off whose altitude was about 6000 feet. It will be seen that Nos. 3 and 4 are alike; No. 4 being taken from the heights at Kavalli's, and No. 3 from the valley of the Semliki, would account for the slight change in outline. The views 5 and 6 confirm each other, and the relative positions given to the two southernmost peaks, as do also



1. View from Igorora

2. View from Butiti

3. View from Awamba

4. View from Kavalli's.

FIG. 3.—SKETCHES OF RUWENZORI FROM VARIOUS POINTS.

Nos. 7 and 8. If all the sketches had bearings attached, or even the approximate focal length of the camera employed noted on them, a far better result would be obtained.

As far as the heights are concerned, the subtended angles S of each peak, in the positions plotted, are given as calculated from their observed elevations. The heights given by the data on No. 5, and those given by my own observations, further confirm the positions of the main and southern peaks. The nature of the positions of peaks II. and III. (Fig. 1), behind the spurs of the main peak, makes their identification from Lungue very doubtful. The heights given are those determined by the A.G.B. Commission calculations, to which, however, a small correction still remains to be made.

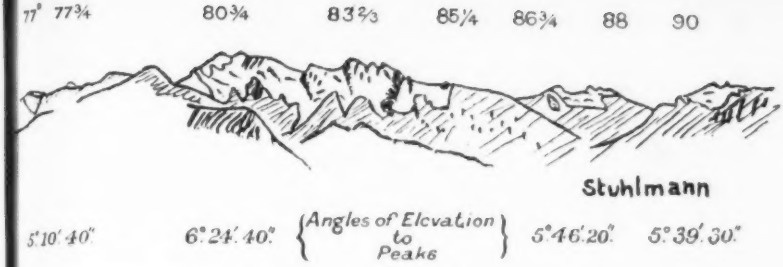
4. The positions used for the points of view are those taken from Herr Max Moisel's map in vol. 17 of the *Mittheilungen* of the Hamburg Geographical Society. The written notes accompanying the two maps explain fully the data on which the map was constructed, and enabled the relative value of the observations to be estimated.

There must, however, have been other observations to the snow-peaks, which I have not been able to use, and I hope these may also be incorporated in a later result obtained from more conclusive data.

A curious thing about the longitude of this map is that the absolute determination on which it was based, Watson's at Rejaf, was confirmed by two others at Magungo and Homia, which gave greater values respectively of 73″ and 58″ of arc, and in spite of this close agreement the longitude appears to be in error more than 10′ (minutes of arc).

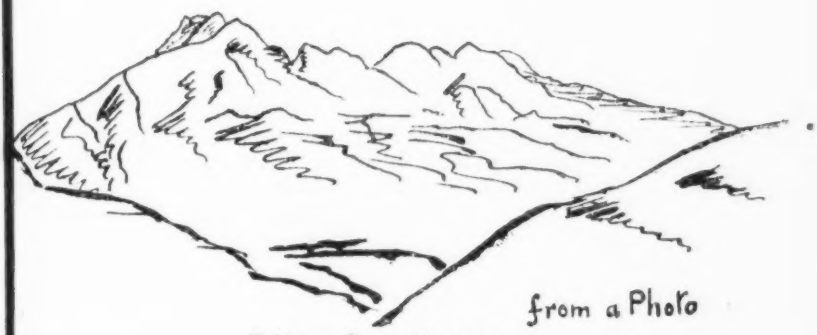
As this map was based on a considerable number of observed latitudes, it was the latitude which gave the most important argument in favour of the A.G.B. Commission's peak being the highest, and not one of the lower peaks. Indeed, its latitude is more northerly than the most northerly edge of Kanyangungwe on Herr Moisel's map. The only peak which might have obscured the view of the highest summit would be the southern peak of Kanyangungwe, namely Kiyanja, and to do this it would have to be not less than 188 feet below Kanyangungwe's apex. As I cannot recollect ever having been perplexed during any of the observations to the peak, varying over an arc of 31°, by other peaks close to it of like elevation, relatively altering their position as I shifted my place of observation, I think this is unlikely to be the case. It is, on the other hand, far more probable that Kiyanja peak was hidden, or almost hidden, over this arc by the mass and width of the higher peak behind it.

On the question of the names of the main peaks, the two most prominent peaks seen from the east are now generally known as Duwoni and Kiyanja, about whose identity there is no longer any question. On the western side Dr. Stuhlmann was given the names of Kanyangungwe by the natives for the most imposing summit



5. View from Lungwe.

6. View from Mtsora



7 View from Karimia

8. View from Kirima

he saw (shown in Fig. 1 as 16,625 feet), and Ngomwimbi for what is evidently Mr. Freshfield's "Southern peak." Dr. Stuhlmann gives no native name for his most southern snow-cap, shown as 14,800 feet (about) in Fig. 1.

The following note has been sent us from the Natural History Museum :—

"Three members of the Zoological Expedition sent out under the auspices of the Natural History Museum, South Kensington—Messrs. R. B. Woosnam, D. Carruthers, and A. F. R. Wollaston (a member of the Alpine Club)—have made the following ascents in this range. On April 1 they ascended Duwoni, the peak rising to the north-east of the Mubuku glacier. This peak has two tops of apparently equal altitude; the southern top, which was reached, was found to be 15,893 feet. On April 3 they ascended Kiyanja, the peak at the western end of the Mubuku group of peaks. The altitude * was found to be 16,379 feet. Each of these peaks has been thought by different explorers to be the highest point in the Ruwenzori range, but from the summit of Kiyanja a still higher peak with two tops, on a spur on the Semliki side of the watershed, was seen in a north-north-westerly direction. The weather at this season of the year proved very unfavourable, the mountains being almost constantly buried in clouds with frequent snowstorms, which prevented the party from making further explorations."

With reference to the above, Mr. D. Freshfield writes that he suggested that the loftiest peak seen by the party was identical with the double peak seen and sketched by him from Butiti, whence it would be almost in the same line as Sir H. Johnston's Duwoni, and overtop it. In his paper read to the Alpine Club in March last, he pointed out that he had had some difficulty in reconciling the outline of the peak seen from Butiti with that of the Duwoni of the Mubuku valley, and suggested that from the valley the former summit might be connected by "an intervening range." The case may be compared to the appearance of the Ortaler over the Alpine watershed from the south or west.

THE PHYSICAL FEATURES OF THE TRANSVAAL.†

By TUDOR G. TREVOR, F.G.S., A.R.S.M.

To a traveller arriving in Johannesburg by the Cape route it appears that the Transvaal consists merely of an extension of the great South African plateau, and that to describe the physical features of the whole country one has only to describe the physical features of one farm, so great does the similarity of one portion of the tableland to any other appear.

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* These altitudes were taken by aneroid, and by the boiling-point thermometer.

† Read before the British Association (Geographical Section E) at Johannesburg, Transvaal, August, 1905. Map, p. 104.

Should, however, the traveller elect to continue his journey either north to Rhodesia, *viâ* Pietersburg, or east to the Indian ocean at Delagoa bay, he finds, usually to his great surprise, that the Transvaal does not consist merely of rolling, treeless downs, but that by far the larger proportion is of an entirely different nature, part being mountainous, with open park-like valleys, and again part flat and lowlying, but densely covered with trees and bush of all description. He then begins to realize that the Transvaal is not the tableland which it is usually represented, but only a small portion of the top, with a great deal of the supports of the table, and also of the floor on which it stands thrown in.

Journeying from Christiana in the extreme west to Komati Poort on the eastern border of the colony, one finds that for 350 miles to Machadodorp one travels on a tableland level in appearance, but gradually rising as one proceeds. At Machadodorp one reaches the escarpment of the plateau, and from thence falls rapidly through broken and much eroded country to Kaapmuiden, a distance of 93 miles; from whence on to Komati Poort, a distance of 43 miles, one travels over a flat floor some 4000 feet below the tableland.

On a journey from Volksrust in the extreme south to Tuli on the Rhodesian border a similar section is observed, but on this journey the section is reduplicated owing to the depression known as the Transvaal Bush Veld, which, cutting across the colony from east to west, separates the outliers of Waterberg and Zoutpansberg from the main plateau.

Entering the Transvaal at an altitude of 5400 feet at Volksrust, one practically remains at that altitude for 150 miles till one reaches Johannesburg, on the Witwaters Rand, which here forms the northern edge of the plateau. Thence one falls rapidly through country that descends in step-like ridges past Pretoria to Hamans Kraal in a distance of about 60 miles. At Hamans Kraal one has come down to an altitude of about 3700 feet, and into a flat country well covered with trees, at about which altitude, and in which country, one remains till reaching Piet Potgieters Rust, a distance of 100 miles, where the Magalaquane river divides the highlands of Waterberg from those of Zoutpansberg. From Piet Potgieters Rust one rises rapidly through the granite hills of Magapan on to the Zoutpansberg plateau, arriving at Pietersburg in the centre of the plateau at an altitude of 4400 feet in a distance of 34 miles. From Pietersburg the plateau extends some 60 miles north, where it is terminated by a sharp ridge of hills known either as Magato's mountains, or the Zoutpansberg, on the north slope of which the ground falls rapidly to the Limpopo flats, the lowest point of which on this section is reached at Rhodes Drift, 150 miles from Pietersburg, where the height above sea-level is only some 1200 feet.

On both the above journeys, or on any other long excursions that one makes in the country, one notices that the characteristics of the ground force one to classify it under one or other of three heads, these heads being—

A. *Plateau country*, known locally as High Veld.

B. *Slopes of the Plateau*, often known locally as "Banken."

C. *Basement country*, locally known as "Low" or "Bush Veld."

As this classification is extremely practical, I propose to describe the peculiar physical features of each of the divisions in turn; for if these are once properly understood, and to them is added a simple knowledge of the river systems of the country, the general physical conditions of the whole colony are at once comprehensible, and most of the secondary phenomena can be accounted for.

As most of my hearers have come from Durban, I may here state that in Natal, on the journey by rail from Durban to Volksrust, the three divisions mentioned are not well apparent, for, the main escarpment of the Drakensberg approaching very

nearly to the coast, the low veld is not well developed. The railway practically leaves what corresponds to the low veld in Natal at Pinetown, and, mounting over the Ichanga range, runs along the slopes country parallel to the main escarpment till it mounts the final rise at Langs Nek, and comes out on the true plateau at Charlestown.

A. The Plateau.

The plateau consists of the Transvaal extension of the great South African tableland and two outliers. The boundaries of the Transvaal from near Mafeking south to Christiana, thence east along the line of the Orange River Colony and Natal to the town of Wakkerstroom, lie on this plateau, so that the Transvaal may be said to contain the north-east extremity of the tableland. The tableland slopes very gradually upward from where it enters the Transvaal on the western border at an altitude of about 4000 feet to its eastern edge in the neighbourhood of Lydenburg, Belfast, and Wakkerstroom, where it reaches an extreme altitude of over 6000 feet.

The northern edge of the plateau enters the Transvaal between Pitsani and Lobatsi, slightly to the north of Mafeking, thence runs east just to the north of Ottoshoop, Krügersdorp, and Johannesburg. Bending to the north after passing the latter town, it becomes strongly defined as it passes Middelburg and Belfast. From Belfast it stretches north, causing the plateau to make an arm, which forms the Lydenburg district. Slightly to the north of Pilgrims Rest this escarpment meets the main eastern escarpment, which runs south in a most abrupt edge to Wakkerstroom, where it enters the colony of Natal. The highlands of Waterberg and Zoutpansberg consist of outliers from this main plateau, separated from it by the great depression known as the Transvaal Bush Veld, and from each other by the valley of the Magalaquane river.

Though Europeans call all the plateau country high veld, the Transvaal Afrikanders are accustomed to use the term in a more restricted sense, and to apply it only to the very highest part of the tableland that lies to the east of the Natal railway line and south of the Delagoa Bay line. A line drawn south from Elandsriver station on the latter line past Greylingstad to the Orange River Colony border would fairly accurately show the western limit of what the Boers call "high veld;" on the other sides it is bounded by the edge of the plateau. Curiously enough, the boundaries of this high veld are almost identical with those of the main coal-measures of the country. As this Boer division has a great deal to recommend it, I shall follow it, and for purposes of description divide the plateau country into—

1. True High Veld.
2. Middle Veld.

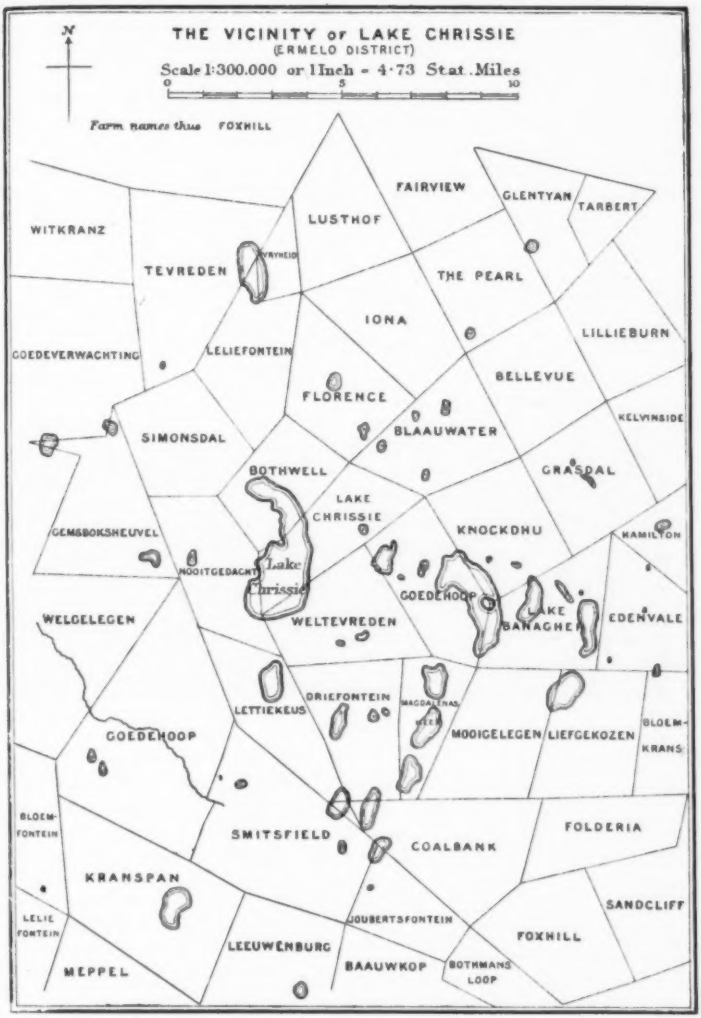
1. *True High Veld.*

The true high veld lies at an altitude of from 5000 to 6400 feet, and is the extreme eastern summit of the great South African tableland. It has an east-to-west length of 120 miles, and a north-to-south extent of 100 miles. Approximately, I estimate it to contain 14,900 square miles. As its boundaries are practically coincident with the horizontal coal-measures, it has an extremely uniform character, and consists of rolling downs, absolutely treeless, but covered with shore-growing sweet grasses. Hills and valleys are both rare, save on the edges of the escarpment. Wide waves or rises, known as "builts," separated by broad hollows called "laagtes," or "vleys," form the bulk of the country.

Running water is rare, save in a few rivers, but every laagte carries water either

in a succession of disconnected water-holes known as "reitkuilen," or in the black sloughs here called "vleys." Small springs of good water are also frequent.

Ranges of hills, except on the escarpment, are absent from this portion of the plateau, but there are occasional isolated hills known as "kopjies"—mostly either



as "spitz kopjies" or "tafel kopjies." The former, as the name implies, are pointed hills, and are usually formed by denuded igneous necks. The latter are miniature table-mountains, usually caused by a horizontal igneous sheet having protected a small portion of the general plateau from denudation. None of these kopjes are

particularly high, an altitude of 100 feet above the general level making a notable hill.

Scattered frequently over the surface of the country are the depressions known as "pans." These are shallow lakes having horizontal beds and no outlet. The largest pan in the country, Lake Chrissie, has a length of about 5 miles, and is nearly a mile broad. Its catchment area extends at least 3 miles around its water-level, and the height of its watershed must be about 150 feet. The greatest depth of water in it is, however, not more than 10 feet. Many of the pans hold water all the year round, but some, again, are always dry, and even Lake Chrissie seems to be steadily getting smaller, the water at the north end having receded permanently more than 200 yards in my own recollection.

In nearly all the pans the water is brackish, and most of the beds of those that are dry are encrusted with saline deposits. Some contain enough common salt to repay working, and were regularly worked till the railway, by introducing Liverpool

HIGH VELD NEAR EDGE OF PLATEAU AT WATERVAL BOREN.

salt at a lower price, rendered the local trade unremunerative. At present I only know of one pan in the country that produces salt for sale, and that is the one at the point of the Zoutpansberg north of Pietersburg. These pans form a remarkable feature of South African scenery, especially in the high veld. Though most common in the horizontal Karroo and Carboniferous formations, they occur in geological strata of all ages. It is difficult to conceive by what agency they were formed, and why they have not long since filled up by the denudation of their catchment areas. In most pans the sides slope gradually down to the bed, but in some abrupt cliffs form the margin, while I know of one that has a precipitous island in its centre. No geologist has, so far as I am aware, worked at the solution of the difficulties presented by the formation and continued existence of these pans.

The true high veld forms the cream of the Transvaal from a farming point of view. The grasses are all of excellent quality; endemic diseases amongst stock are unknown, and epidemic plagues are less severe than in other parts. The soil is not rich, but is easily worked over large areas, and is not too poor to repay

working. The climate is absolutely healthy for man and beast, and is one of the most invigorating in the world. The temperature varies from an extreme summer heat of 90° in the shade to several degrees of frost in the cold winter's nights.

The rainfall is at its greatest on the edge of the eastern escarpment, where over 50 inches fall in the year, but diminishes to about 30 inches at Boksburg on the west. A fair proportion of this rain falls steadily on cloudy days, but heavy tropical thunderstorms are frequent. The occurrence of the rain falling as it does in the autumn months is one of the greatest drawbacks to the country. In spring, when rain is earnestly needed to bring on the young crops and grass, it is often entirely wanting; and in autumn, when dry weather is required to mature the grain, useless rains frequently destroy it. The whole Transvaal suffers from this disadvantage, and as it is a most important one, I have attached to this paper a table giving the average rainfall registered at the different observing-stations in the Transvaal in the season 1904–05.

2. *Middle Veld.*

The remainder of the plateau, after the true high veld has been divided off, is often known as middle veld. It consists of that portion of the tableland lying west of the Natal railway line. Though some portions of it, such as the Rand, rise to over 5000 feet, it may be said to lie at an altitude of from 4000 to 5000 feet above the sea. The western portions, consisting of districts of Lichtenburg and Bloemhof, lying for the most part on horizontal Ecca shales, approximate very closely in appearance to the true high veld. The main portion, however, consisting of upturned older rocks, differs considerably from the country just described. Though builts and vleys alternating still take up most of the country, long low stony ridges and lines of hills known as rands make their appearance. Pans become less frequent, and watercourses, either dry or running, are of common occurrence. The rands and kopjes are usually covered with protea scrub, and though the builts and laagtes are still bare of trees, the lower river-valleys are often pleasantly sprinkled with mimosa.

The grasses of the middle veld are not nearly so good as those of the true high veld, neither is it so healthy for stock. Horned cattle do well, but sheep poorly; while in the summer the disease known as horse-sickness takes its toll of all grazing horses. For agriculture, the soil, being derived from the older rocks, is richer than in the true high veld, but, being more broken up by rock bars and more stony, is not so conveniently worked. The rainfall is about 30 inches on the east, but gets smaller toward the Bechuanaland border. Toward the west, also, steady rains appear to me to get rarer, and tropical storms more frequent.

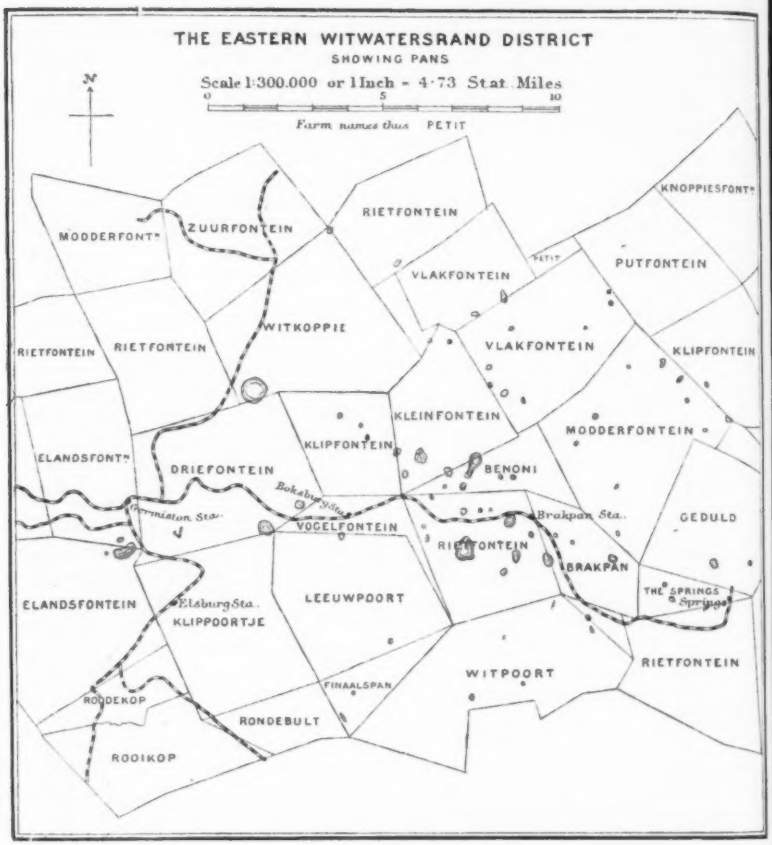
The characteristics of the plateaus of Zoutpansberg and Waterberg are similar to the above, but, lying farther to the north, the climate is much hotter, and malarial fever makes its appearance even on the plateau. Endemic diseases are very severe amongst all kinds of cattle, and practically the only stock that will live are the native breeds of cattle, goats, and thick-tailed sheep, and of these the horned cattle have been almost exterminated in the last few years by epidemic plagues.

The approximate total area of the whole plateau ground in the Transvaal is, according to my calculations, roughly as follows:—

	Square miles.
True high veld	14,900
Middle veld	18,800
Zoutpansberg plateau }	4,400
Waterberg „ }	
Total	38,100

B. Slopes of the Plateau.

The slopes or descent from the plateau vary considerably in height and extent, being in some places precipitous and abrupt, as in the Lydenburg escarpment; or gradual, as in the section taken by the railway from Johannesburg to Pretoria and the north; or, again, very much broken and cut up into outlying hills, as in North Lydenburg and Barberton. From Mafeking to Johannesburg the breadth of the



slopes is usually about 40 miles, and the ground falls in a succession of steps, each step being as it were held up by a range of hills that, being of harder rock, has resisted denudation and protected the ground on its upper side.

The three main ridges are the Witwatersrand, the Witwatersberg, and the Magalies Berg, and an excellent view of them and of this description of country can be got from the higher suburbs of Johannesburg, such as Parktown. The highest of these ridges—the Witwaters Rand—makes the watershed between the Indian and

WATERFALL OVER EDGE OF PLATEAU AT SABI, LYDENBERG.

Atlantic oceans. Beyond Johannesburg, at Elandsfontein, the defined edge between the plateau and the slopes dies away, but makes again 30 miles to the north in the neighbourhood of Witfontein station, and, again running east, becomes more and more sharply defined as it goes. From Middelburg to Olifantspoort, where the eastern and northern escarpments meet, the slopes are very much cut up into outlying hills, and the mountains which have resulted from the denudation of the plateau form the most romantic scenery. On the east from Olifantspoort to Wakkerstroom the main slope is very precipitous and abrupt, but at its foot foothills and valleys, stretching for some miles, correspond closely with the rest of the slopes country. The rock at the base of the slopes is in every case granite, and their upper escarpment of sedimentary rocks.

From the sedimentary rocks, or from their junction with the granite, all the rivers that run to the Indian ocean take their rise and obtain by far the greater part of their water. The whole extent of the slopes country is beautifully watered with clear running brooks and streams, which, breaking their way through the ranges that make the steps of the plateau, give rise to those poorts which form such a characteristic feature of South African scenery.

The valley bottoms are well wooded with open-growing mimosa and other trees, the sides park-like with scattered timber, and the hills covered with protea, euphorbia, aloe, and other picturesque and peculiar growths. High up on the sea faces of the eastern slopes fine patches of heavy timber fill the dingles and gorges. These patches are known as "woodbushes" in contradistinction to "bush," which is the term used for the scrub mimosa forests of the low veld. These woodbushes are not often of great extent, but they contain huge timber trees, many carrying over 100 cubic feet of timber. All the hardwood trees of the Cape Colony are represented in them, and formerly all the waggon wood used in the country, and most of the farm and household timber, were cut from them. The largest of these woodbushes or timber forests are those of the Pongola on the extreme south, and of Haenertsburg and the Woodbush mountain on the north of the eastern escarpment. These forests are very local, and begin like plantations, with little or no loose timber outside their edges. The trees in them are either peculiar to them, or grow only in a dwarf form outside their margins. The bushcutters say that the forest grows only where the sea-mist strikes and hangs on the mountain. One has but to observe the mountain for some time to notice the connection, for the mist appears first on the forests, and often hangs there for days when the rest of the hills are clear; but whether in reality the forests cause the mists to settle, or whether the mists cause the forests to grow, I am not prepared to state.

Another peculiarity of these woodbushes is that even in the smallest of them the flora and fauna are entirely different to those a few yards outside their boundaries. The woodbushes have their own animals, birds, flowers, and even butterflies, which are peculiar to the actual limits of the forest itself, and I do not know of one antelope or other animal that frequents both the woodbush and the surrounding open country according to its humour, in the way that our European animals use both the woods and the fields.

Though the slopes country is infinitely the most attractive in the Transvaal, it suffers from many disadvantages. It is deadly for horses in the summer, neither do sheep do well. It appears excellent country for Angora goats, but poison in the verdure and a disease known as blue tongue have always rendered them unprofitable. For horned cattle the country is excellent for grown stock, but the mortality amongst young stock is so great that I have never known a man commercially successful in breeding cattle in this region. Most of the slope country is perfectly healthy for man, but in the lower valleys malarial fever makes its appearance, and

EDGE OF PLATEAU AS SEEN FROM BELOW, KANTOOR BARBERTON

in some, such as Ohrigstad and Elandsriver, has been known to drive out the population.

For agriculture the actual ground that can be cultivated is small, consisting only of the narrow bottoms of the valleys, but such as there is of it is of excellent quality. Everything can be grown at one altitude or another in the slopes country, from the apples and wheat of England to the tobacco and bamboos of the tropics, and for citrus fruits I should say that it was certainly unrivalled in Africa, if not in the World. Unfortunately, owing to the configuration of the country, all agriculture has to be on such a petty scale that one has to doubt if this can ever become an exporting district.

The slopes surrounding the Waterberg and Zoutpansberg plateaus are so similar that no special description of them is necessary, but, being farther north, all the disadvantages of the southern slopes are accentuated considerably. As to the area of the slopes, only the roughest approximation can be arrived at, as their lower limit is so indefinite. The portion of the attached map on which I have marked them represents, however, 27,100 square miles, and that, I think, can be taken as fairly accurate.

C. Basement Country, or Low Veld.

All the remainder of the Transvaal, not previously described either as plateau or slopes, consists of basement country, or low veld. On the northern side of the plateau the typical low veld begins at an altitude of about 4000 feet, but below the eastern escarpment the abrupt slopes continue down to 3000 feet, and it is only at that line that the characteristic appearance of the low veld begins. The lowest portion of the low veld lies along the Portuguese border at less than 1000 feet of altitude, but so great is the similarity of this country that it is quite impossible to recognize from a low-veld landscape whether one is on the Portuguese border at an altitude of only 800 feet or on the Bechuanaland line at 4000 feet. Exactly similar country stretches far away to the north and west beyond the borders of the Transvaal.

The whole low veld is flat and covered with scrub bush, mostly of mimosa and thorn-bearing trees. Most of this bush is gnarled and crooked, and useless for all purposes. A few varieties of the bush trees, however, grow big enough and straight enough to make fencing posts and furniture woods; but, except in the river courses of the lower parts of the country, there is nothing that one can call timber.

Low stony ridges and kopjes, mostly of the spitz variety, occur sparsely over the low veld, and in places peculiar granite kopjes, consisting either of one huge bare rock or of a pile of enormous loose blocks of granite, appear. Granite, in fact, is the main country rock of the whole low veld.

Water in this country is very scarce. Rain-water stands in small pans for some weeks after it has fallen, but otherwise practically the only water is in the rivers, which, rising in the plateau or slopes, pass through the low country on their way to the sea. With the exception of a few mineral springs, most of which are thermal, I cannot call to mind a single permanent perennial spring of any magnitude in the whole low country. Small soakage springs are occasionally met with, but these are often brackish and are not perennial.

The rivers also diminish very considerably in volume, or even dry up as they cross this country. At Rhodes's drift, near Tuli, the Limpopo is often quite dry at the end of the winter, though where it enters the bush veld it is a considerable river at the same period. The Selati, which, when it falls from the slopes, is

AN AFRICAN "POORT"—JOHANNISPOORT, PIETERSBERG.

A GRANITE KOPJE, ZOUTPANSBERG, MUTITZIES.

a fine perennial stream resembling our English trout streams, dries up completely before it reaches its junction with the Olifants river, and numerous other instances might be quoted. So marked and well known is this peculiarity, that any "old

hand" looking for water in the foothills at the edge of the low veld will always follow the watercourses upward into the hills, and not downward into the flats, as he would probably do elsewhere.

Sand rivers and dry rivers also form a feature of the low veld, especially in the north. The former of these are dry beds of sand, often over 100 yards wide, in which water can sometimes be got by digging a foot or two below the surface, but in which water seldom or never flows on the surface. The dry rivers are torrent-courses, which often extend for miles, and occasionally contain holes full of stagnant water. At the present time no torrents ever seem to fill these courses; a local storm may set them running for a mile or two, but the water is quickly absorbed by the ground and stored in the inequalities of the bed. The Malatie river, near Leydsdorp, is a good example of such a dry river. Its course stretches some 40 miles, but it has never been known to run its entire length, and, judging by the timber that encumbers it and the absence of drift at its lower end, it never has done so in recent times.

It is worth mentioning here that the H.E. Proprietary Company recently put down two bore-holes in a belt of schist included in the granite near Leydsdorp, and that neither bore-hole could be proceeded with to any great depth, because at about 300 feet they had not only not struck any water, but they actually lost the water they were pumping down the rods to keep the hole clean—this notwithstanding that at that depth they were far below the lowest depression of the country.

Another feature of the low veld, which is particularly noticeable when looking over any part of it from an altitude, is the long strips of treeless spaces which meander through the bush like rivers. The soil in these is usually black organic turf, which suggests the presence of water, but I have never found water in them, nor are they in any obvious way associated at the present time with water. A peculiar feature of that part of the bush veld north of Pretoria is a strip some 20 miles wide and 150 miles long, known as the Springbuck flats. This consists of an almost treeless and waterless belt of deep black turf, and appears to owe its origin to a sheet of a peculiar amygdaloidal rock that underlies it.

The climate of the low veld is, as might be expected, more tropical than that of the other divisions. The summer maximum shade temperature rises to 113° Fahr., but the nights are almost invariably cool and pleasant. Frost occasionally is known down to the 2000-feet level, but there are spots as high as 3000 feet where it has never been observed.

As to the rainfall, it is impossible to give any figures, as there is nowhere in the low country where a continuous record has been kept. Where the low veld approaches closely to the main escarpment, the rainfall appears to be about 30 inches, and steady rains occur, but the farther one gets from the mountain the less and more erratic does it become. I lived once near a native kraal where no rain fell for twenty months. It was not a particularly dry season elsewhere, but no thunderstorm happened to strike that spot.

The soil in the low veld, being usually derived from granite, is poor, but certain portions, where schistose or igneous rock occurs, form notable exceptions. For instance, the Springbuck flats are exceptionally fertile, and, could water be obtained, would probably support a larger population than any similar area in the Transvaal. For various reasons, however, practically no cultivation has ever been attempted by white men in the low veld, though at present several attempts to do so are being commenced.

The pasture in the low veld is uniformly excellent, and I should imagine that an acre there had a greater feeding value than in any other of the divisions of the country. Unfortunately, all stock suffers in the summer from many endemic

diseases, and epidemic plagues are most destructive. At the present time it may be said that, with the exception of a few herds of miserable native goats, with an occasional thick-tailed native sheep, the whole low country is devoid of stock. Nor, unless something can be done to get at the root of the endemic diseases that decimate all introduced and all young stock, do I think that it can ever become any use as a pastoral country.

Malarial fever is rife from one end of the low country to the other, but varies in intensity, not only with the altitude, but locally. Above 3000 feet I do not think that the malaria is more severe than in the south of Spain, and it should not interfere seriously with the population of the country; but below that level the fever takes a virulent form, and blackwater fever makes its appearance. It may, I think, therefore, be regarded as certain that below that level the country will never carry a European population.

A LOW-COUNTRY LANDSCAPE, WITH TYPICAL ANTHILL IN FOREGROUND.

The area that I have marked on the attached map as basement country, or low veld, works out at 52,500 square miles. We have therefore seen that, according to my approximations, the Transvaal consists of—

32·4 %	plateau country,	or 38,100	square miles.
23·0 %	slopes	„ 27,100	„
44·6 %	basement	„ 52,500	„
100·0 %		117,700	„

The foregoing completes my description of the physical features of the Transvaal as they have impressed themselves on my mind during eighteen years spent in almost constant travelling in the country; but before closing this paper I should like to touch on the water system of the country, and on two points of great interest connected with it.

The Water Systems.

The drainage system of the Transvaal is extremely simple, all the rivers of the country uniting into five before reaching the sea. They are—

The Vaal,
The Limpopo,
The Komati,
The Umbelusi,
The Pongola.

The Vaal drains the greater part of the main plateau westwards into the Atlantic ocean. The Limpopo and its great tributary, the Olifants river, carry off the waters of the whole northern escarpment and slopes of the main tableland, and of the outliers of Waterberg and Zoupansberg as well, into the Indian ocean. The Komati, Umbelusi, and Pongola drain the eastern slopes of the plateau also direct into the Indian ocean.

Both the Limpopo and Vaal have similar characteristics—carrying a huge volume of water in their summer floods, they almost or quite cease to flow in the winter. This, coupled with the fact that both in the main courses run deep between high banks, has rendered them useless in the past for either irrigation or industrial purposes. The same causes have also rendered the eastern rivers very unsatisfactory as power-producers. To a certain extent the tributaries of the Komati have been used for power purposes in the Barberton district, but with uniformly unsatisfactory results. None of the Transvaal rivers are navigable while they run in the Transvaal territory, even for native canoes.

Alluvial Soil.

The absence of alluvial deposits of any extent is one of the most remarkable features common to all the rivers of the country. It would be difficult, if possible, to find a continuous alluvial flat of say 1000 acres in extent in any of the valleys of the country, and flats of alluvium even of more than 50 acres are most uncommon. Everywhere the soil seems made of rock decomposed *in situ*. All the rivers, even in the low country, run on rock bottoms, and the country rock outcrops everywhere.

Geologists have noted that the main features of the Transvaal landscapes were eroded in precarboniferous days before the laying down of the South African boulder clay or Dwyka conglomerate. I think that contention can easily be proved, and, moreover, this absence of alluvium and other evidence incline me to believe that very little of the denudation that we see has been done in recent geological times. Over the whole eastern low veld a recent gravel wash is spread over the tops of the rises. In the Western Transvaal, the Orange River Colony, and Bechuanaland, similar gravel beds occur high up on the rises and kopjes. In the bushveld north of Pretoria is a long line of deposits of calcareous tufa over 100 miles long.

These facts would appear to indicate that this country had been submerged in recent geological times, and if so, the absence of alluvium and the fact that the pans have not yet been filled up by the denudation of their sides, might be accounted for. This absence of alluvium has two important results. In the first place, there are no great alluvial flats where irrigation on a large scale might encourage an agricultural population to settle. In the second place, though the gold mines of Barberton and the low country were probably as rich on the surface as any in the World, no considerable alluvial goldfields have been found attached to them. Nor is it probable that any will be found, for there are no great deposits of derived

alluvium where only large quantities of alluvial gold could be expected. The surface soil often contains nuggets and gold dust, but this appears due to the decomposition *in situ* of gold-bearing schists.

Springs.

The last feature of the Transvaal to which I wish to attract attention is one of vital interest to the very existence of the country. I allude to the water-springs and fountains, and to the evidence that one constantly hears and sees that the supply from these has steadily diminished since the white man first settled in the country, and appears to be still diminishing.

In a country such as the Transvaal, where systematic scientific observations have only just begun to be recorded, it is impossible to prove this drying-up of the country by figures. But there is abundant evidence, both human and natural, that some such change is in progress, and my own experience bears out the evidence From Tuli to Volkrust, and from Mafeking to Komati Poort, every old inhabitant of the rural districts can point out springs that have dried up, creeks that have ceased to run, and pans where the water has either receded considerably or entirely disappeared.

The common belief to which I incline is, not that the rainfall has diminished, but that, owing to the universal practice introduced by the white man of burning off all the old grass every winter, the ground becomes hard-baked, and that the rain-water, instead of soaking in and strengthening the springs, runs directly off the surface and away down to the rivers.

In a general paper such as this it is, of course, impossible to go thoroughly into any such subject as this, however important it may be; but I mention it in the hopes that attention and inquiry may be directed to an apparent natural change which, if true, threatens the whole existence of the country and its inhabitants.

ADMIRALTY SURVEYS DURING THE YEAR 1905.

By Rear-Admiral A. MOSTYN FIELD, F.R.S., Hydrographer.

Under the orders of the Lords Commissioners of the Admiralty, eight of His Majesty's vessels, with three small hired vessels, manned by an aggregate of 80 officers and 747 men, have been employed on hydrographical surveys on various stations at home and abroad.

A naval officer, assisted by officers of the Royal Naval Marine, has also been employed, with the sanction of the Admiralty, under the Indian Government, in charge of the surveys in Indian waters.

A detailed report of the labours performed by each surveying ship has been prepared, and, in accordance with custom, has been presented to Parliament. The following is a brief summary:—

Notwithstanding the progress of hydrography, and the constant employment of our own and foreign surveying vessels in many parts of the world, the requirements of navigation increase more rapidly than the advance of surveys. During the year 1905 no less than 522 rocks and shoals which were dangerous to navigation were reported and notified to the public through Notices to Mariners; 1129 miles of coast-line have been charted, and an area of 4295 square miles has been sounded.

On the *East Coast of England*, various re-examinations of the Thames estuary were carried out. Considerable changes were found to have taken place. Some work was also done at Harwich and Lowestoft.

On the *South Coast of England*, at Portsmouth, the outer bar was resounded, and areas used for spoil deposit by dredgers were examined. The resurvey of Tor bay was completed. At Plymouth, the dredged area above the Royal Albert bridge was resounded, and Asia pass was examined.

On the *West Coast of England*, Fishguard bay was resurveyed.

On the *West Coast of Scotland*, the resurvey of the Sound of Mull was resumed and completed from a mile east of Lismore lighthouse to Ru Pennygown. The north-western portion of the sound and Tobermory harbour were triangulated and plotted ready for sounding next season.

Loch Kishorn with its approaches to Loch Carron, Broadford bay, and Loch Dunvegan were resurveyed.

In the *Orkney islands*, Pierowall road in Westray and Hoy sound were resurveyed.

On the *Newfoundland coast*, a further search was made for the reported bank off the Burgeo islands, but no indications of shoal water were found. The survey of the Bay of Exploits was resumed. An investigation was made of a reported magnetic disturbance off Flowers ledge in the Straits of Belleisle; no evidence of such disturbance was found, but the Flowers lighthouse was found to be wrongly charted.

On the *West Coast of Africa*, the Liberian coast from Manna river to Monrovia bay was resurveyed, plans being made of Cape Mount and Monrovia bays.

A reported shoal of 6 fathoms, 27 miles north of Cape Barbas, was unsuccessfully searched for, 75 square miles being sounded over without any indication. A further attempt is being made to determine with more certainty than on the previous examination in 1871 the relative volumes of water pouring in and out of the Straits of Gibraltar at any one time and also at different depths. With this in view, the *Goldfinch* spent a month sounding in the straits and selecting the most suitable spots for making observations. The work is not yet complete.

In *British Columbian* waters, the work for the season was arranged in such a manner as to connect together all previous surveys of the *Egeria* in the archipelago lying between the east coast of Vancouver island and the Strait of Georgia, the special area for work being that lying between Gabriola island and the boundary-line between the United States and British Columbia in the vicinity of Pender and Stuart islands.

In *China*, a survey of the east coast of Lantau island, in the neighbourhood of Hong Kong, was commenced.

Port Shelter, with the adjacent Rocky harbour at the entrance to Mirs bay, was completed, and a survey of the coast from Lama islands to the Brothers commenced.

In *Borneo*, Kimanis bay was surveyed. The coast survey was carried from Labuan northward to Dukan point. On the east coast of Borneo, a reported shoal in Sibuku bay was successfully searched for and charted.

In *New Zealand*, a portion of Hauraki gulf was resurveyed.

In *Australia*, the survey of the inner route on the Queensland coast was carried from Pickersgill reef to Snapper island. Several fresh offlying dangers on the inner edge of the Barrier reef were found, but none near the usual track of vessels.

In the *Red sea*, the approaches to Mersa Sheikh el Barghut (Port Sudan) were surveyed. This place is the terminus of the recently opened Atbara-Red sea railway.

In the *Indian ocean*, Messrs. J. Stanley Gardiner and C. Forster Cooper were embarked in H.M.S. *Sealark*, on May 9, for the purpose of making a scientific exploration of various coral islands and submarine banks included in the area

between the Chagos archipelago, Mauritius, Madagascar, and the Seychelles group. The voyage lasted nearly six months, during which time dredging, sounding, magnetic observations, and other scientific and hydrographical work, were carried on uninterruptedly. Messrs. Stanley Gardiner and Forster Cooper disembarked at the Seychelles on October 21.

On the *Ceylon coast*, a survey of the approaches to Colombo was commenced.

The Indian Government conducted surveys of Koweit in the Persian gulf, and in the Andaman islands of Stewart sound; also the west coast of Middle Andaman island, lying between North Passage island and Rougat bay.

During the year the Hydrographic Department has published 110 new charts and plans, and 36 plates have been improved by the addition of 43 new plans, while 5320 corrections have been made to the chart plates. The number of charts printed for the requirements of the Royal Navy, for Government Departments, and to meet the demand of the general public, has, during the year, amounted to 689,930.

REVIEWS.

ASIA.

The Far East in 1905.

"The Re-shaping of the Far East." By B. L. Putnam Weale. London: Macmillan, 1905. Two vols., pp. xv., 548; x., 535. *With a Map.*

His previous book, 'Manchu and Muscovite,' compels the reader to defer to Mr. Putnam Weale as an authority on Far Eastern questions. The present large work is of peculiar interest as containing a very close study of political situations and questions written with a mind unaffected by the actual signature of peace between Japan and Russia, for it dates from the period of the war itself. As a consequence, in the political chapters which occupy part of the first and the whole of the second volume, one obtains such interesting analyses as the probable course of events if the war should be carried to the point of exhaustion, based on developments up to a certain point in the war itself. It is unnecessary to go more deeply here into these chapters; it is sufficient to remark that the book, from this point of view, is valuable, not only as an expert expression of opinion, but as a history of events which preceded the war, for there are both an introductory historical chapter and a number of appendices giving texts of treaties, conventions, and so forth, of the decade before the publication of the book. The outstanding chapters of the first volume furnish a description of some of the author's journeys in the Far East. It is a matter of opinion whether the association between these two sections of the work is entirely happy. The introduction of the reader into the proper atmosphere of the subject is the purpose of this narrative, which is perhaps, however, barely sufficient in itself. Nevertheless, the journeys described are extensive, and the narrative full of interest. A voyage up the Yangtse, journeys on the unfinished Hankow-Peking railway, the German Tsingtao railway, and the Japanese line between Fusan and Seoul, with a glimpse of Japan itself, are found in these chapters of travel, which are not wanting, so far as they go, in the presentation of the geographical environment of political problems in these lands. We who read are fully impressed with the vast wealth of China that awaits development by the opening of communications; we learn such geographical lessons as that the Hwang-ho sets a natural boundary between two lands, as it were, of different characteristics, and we meet, incidentally,

with such curious details as the author's observations on the little isolated family of Chinese Jews in Kaifengfu. As compared, however, with the historical introduction and the political chapters, the travel-narratives may appear to some in the nature of a makeshift for a fuller geographical treatment of the subject, but to those who find this section sufficient, the entire work cannot fail to be deeply interesting. A large and good map satisfactorily illustrates the whole.

AFRICA.

The Rhodesia Ruins.

'Mediæval Rhodesia.' By David Randall-MacIver, M.A., D.Sc., F.R.G.S., Laycock Student of Egyptology at Worcester College, Oxford. London: Macmillan & Co. 1906. 4to, pp. xvi., 106. *With Frontispiece and* 36 *Plates.*

We have here the results of an inquiry, undertaken at the suggestion of Sir Lewis Michell, and in connection with the African visit of the British Association in 1905, into the age and purpose of those stone-built ruins of Rhodesia, of which the "Great Zimbabwe" has been hitherto the best-known example. From the first regular examination of these ruins, by the late Mr. Theodore Bent, in 1891, down to the year 1905, there has been, as is well known, intermittent controversy, accentuated by very imperfect knowledge of the ruins on the part of the more cautious theorists, and by great boldness of imagination on the part of those who knew the sites most thoroughly. South African opinion for the most part followed the lead of Mr. Bent, and attributed the ruins to Sabæan Arabians, or more specifically to the Queen of Sheba; a few reserved judgment until a trained excavator should have explored the rubbish-heaps and sub-soil; others, and among them some who were well qualified to judge of this point, regarded the modern Kaffir, with his peculiarly autocratic chieftaincy, as competent to organize both the building of a Zimbabwe and the working of "King Solomon's mines."

Dr. Randall-MacIver went out with considerable experience of the methods of modern excavation; he had every possible help from the Rhodesian authorities; he covered—considering that he was necessarily only in the field for about three months—a great extent of ground; and his results are presented in a form which is admirably clear, and well set out with plans, views, and photographs of characteristic objects. The substance of his argument has been stated already in his paper before the Research Committee of the R.G.S. in the last volume of this *Journal* (p. 325 ff.); and the principal considerations which have been urged on the other side reappear in due order in the discussion which followed that paper. For his evidence, however, and for detailed descriptions of the sites and the objects found on them, we are referred to the book under review; and it is one which certainly marks a turning-point in South African archæology. It will be indispensable to students of Kaffir history and culture, and no less to African ethnographers generally, and to investigators of Arab and other Semitic enterprise on the shores of the Indian Ocean.

On the main question, of the age and character of these ruins, Dr. MacIver has proved his point. Questions of this kind are decided, not by the quantity, but by the quality of the evidence. To argue from the style of the architecture, the sculpture, or the ornament in these ruins is to argue in a circle, and this is equally the case whether the comparison be with ancient Egyptian or modern Kaffir art. It assumes exactly that which is to be proved; namely, that there is anything more than an accidental likeness between the two styles which are compared. To argue from the assumption that this or that people could (or could not) desire gold, or get it from the ground, or lay their heads together to build stone forts, is equally to argue from the conclusion backwards; and so also is it to argue from

the depth or thickness of a deposit, unless we know the rate of deposition. It is only on the occurrence, at a particular level, of imported objects of known style and date, as Dr. MacIver realized at the outset, that a valid chronological argument can be based; and he is therefore greatly to be congratulated on having secured, in so brief a tour, good evidence on this particular point. This evidence comes from no less than three distinct sites, and covers a period extending from the end of the thirteenth to the seventeenth century A.D. It exists in the shape of fragments of Nankin china and other well-known Oriental fabrics, and the evidence is preserved in the Buluwayo Museum.

This discovery gives the death-blow, as the evidence stands at present, to all theories, based on observation of the layers of *débris* from which these fragments came, which refer those layers to an earlier date than that of the fragments themselves. It supersedes all *à priori* arguments from the appearance of soapstone beams, carved birds, and other works of art; and in the event of any one wishing hereafter to revive any theory of an earlier date for these ruins, it puts the *onus probandi* on him.

In three points, however—and one of these is crucial—Dr. MacIver's argument does not yet seem quite flawless, and if, as we may hope, he finds some later opportunity of revisiting South Africa, he will, no doubt, not be long in setting them right.

In examining the great kitchen-midden at Dhlo-Dhlo, one could wish that he had—to use his own words—"observed the excavator's primary axiom, and dug to bed-rock." His inference that "as no distinction whatsoever could be observed in the character of the deposits found in the several levels down to that point, and only a very slight depth remained below it, there can be little doubt that the results are representative," was a very natural one, and no doubt he did all that was possible in the time which he allowed himself at Dhlo-Dhlo. But it is open to the critic to reply that it is precisely the existence, at Zimbabwe, of a thin layer of a different character, at the bottom of a long sequence of uniform strata which makes him qualify his conclusions on that site as he does. "I must frankly confess," he says (p. 64), "that I am unable to decide whether this layer is older than the hut foundation or contemporary with it. On the one hand, it might have been deliberately placed there as a bed for the foundation; on the other, it might have been the kitchen midden of an earlier settlement." But, in the latter event, to which settlement do the stone walls belong? There is no evidence that Dr. MacIver followed either stratum further than *up against* these walls. What if the lower layer were subsequently found to be of the "kitchen-midden" type, and yet banked up against the walls, which he attributes to the later stratum? The only possible conclusion would be that the walls existed already when the earlier stratum was being formed.

The same critic might add that the stress which Dr. MacIver lays on the practical identity of modern Kaffir pottery with the pottery from the lowest layers both at Zimbabwe (p. 63), and apparently also at Dhlo-Dhlo (p. 45), might easily have led him to the conclusion that culture here had been practically stagnant; and that, this being so, the depth of the deposits affords practically no evidence as to the age of its lowest layer, unless the rate of deposition can be determined somehow independently. And as it happens that he has omitted to mention the depth (either absolute or relative) at which he found his fragments of sixteenth-century Nankin china in this kitchen-midden, we are for the moment confronted with an "unknown."

Fortunately, however, the date of Dhlo-Dhlo does not depend primarily on the contents of this kitchen-midden, but upon Nankin china of the seventeenth

century, from below the cement foundations of a hut which is, in Dr. MacIver's opinion (p. 48), "beyond all question contemporary with the first stones which were ever laid at Dhlo-Dhlo." As this is a point upon which criticism will certainly be directed, it is a pity that he has not given some indication, in detail, of the evidence on which he bases this assumption. It is a pity, also, that Mr. C. H. Read, though he dates these fragments of china "to the seventeenth century without doubt" (p. 52), has to add, "but I have not seen the original." Surely this should have been arranged.

The third point on which formal doubt might arise is in the case of "enclosure 15" at Zimbabwe, where the "mediæval Arab glass and Nankin china" (p. 63) were not found by Dr. MacIver himself, but by a previous excavator, Mr. R. N. Hall. Exactly *where* it was found is not stated; but in any case it was apparently not, as at Dhlo-Dhlo, *below* the cement floor, but *in* the cement mass which stands upon that floor. It is quite true that the kind of pottery which Mr. Hall "calls Makalanga, and which is, in fact, exactly like modern Kaffir pottery," was found below the cement floor, in the lowest layer which contained any artefacts at all. But (1) the likeness of "Makalanga" to "Kaffir" pottery only proves anything as to relative age, if we know the rate at which culture was changing in the interval; (2) at Zimbabwe, *ex hypothesi*, culture was not changing, for the fabrics are "exactly like;" and (3) even supposing slight changes were discernible, the objects in question occur lower down in the series than the lowest possible level of the Nankin china, and consequently are not dateable by it. Once realize these three qualifications, and the value of the Zimbabwe evidence becomes appreciably less.

These, however, are merely formal defects in an argument which is practically conclusive. There can be very little doubt, after Dr. MacIver's work, that the Rhodesian ruins are of latish mediæval date; and that consequently the Portuguese records are good evidence as to their probable makers, as they are in any case for some of their earlier (if not for their first) inhabitants. This granted, the Portuguese records tell their own story of gold-working Kaffirs living in walled towns and trading with the Europeans from the coast, but otherwise undifferentiated from other South African peoples.

It is probably only a slip of the pen which makes Dr. MacIver say on p. 64 that "it was the same *race* which deposited the rubbish and which built the hut above it, for precisely the same objects are found within both." If this were so, the similarity between these objects and modern Kaffir objects would prove identity of *race* between the modern Kaffir and the builders of Zimbabwe; yet part of Dr. MacIver's theory is (p. 58) that some one of those "terrible waves of devastating conquerors which have swept over South Africa periodically, as long as we have any knowledge of its history, may have blotted the inhabitants off the face of the earth and left the city to fall into ruins;" and he gives historical instances of such raids in 1570 and 1602 (pp. 102–3). Clearly, what he means is not "the same *race*," but "a people of identical *culture*."

One final cavil. The descriptions of the excavations would have been easier to follow if the exact sites and extent of the trenches had been shown on the plans.

J. L. M.

HISTORICAL GEOGRAPHY.

History of Cartography.

'Die Reformation der Kartographie um 1700.' Von Christian Sandler. With Atlas of facsimile Maps. Munich and Berlin: R. Oldenbourg. 1905.

No period could be named more important for the history of cartography than that which formed the borderland between the seventeenth and eighteenth

centuries. Prior to the elaboration of accurate methods for the astronomical determination of longitudes, the maps of even the most careful workers could stand on no certain basis, and we find enormous discrepancies in the positions assigned even to the most important places, in those of the seventeenth century. Dr. Sandler has done good service in tracing the progress of reform, which began in the early part of that century, but reached its culmination only with the advent of the eighteenth. The part played by Delisle in this reform, towards which the whole study works up, is matter of general knowledge, though the services rendered by him, as compared with those of his successor D'Anville, have not always met with quite the recognition they deserve. But by going back to the first beginnings of the movement, and assigning to each actor his proper place in the complete performance, the author has treated the subject in a far more instructive manner than could have been the case had he began and ended with the labours of any one man.

The maps of the sixteenth and early seventeenth centuries were all alike seriously at fault in the undue extension, in longitude, of the old world, and especially the Mediterranean. And though the experience of sailors had long suggested that this was the case, the map-makers, as distinct from the compilers of hydrographical charts, held fast, with few exceptions, to their stereotyped ideas. With the continued advance of astronomical science, the basis of reform was in time supplied, but even before the tables of Cassini had provided the means of determining longitude by observations of Jupiter's satellites, attempts had been made to evolve some sort of order out of the existing chaos. The tables of positions industriously collected by men like Kepler, Varenius, and Riccioli show considerable improvement. Thus apart from Constantinople, the longitudes assigned by Kepler to European places only once show an error of more than 1°. The map issued in 1630 under his auspices with the aid of his friend Eckebrecht ('Remarkable Maps:' F. Muller, Amsterdam, Part 2, No. 8) is noteworthy for its comparative accuracy as regards longitude, though this merit has not, Dr. Sandler points out, been sufficiently recognized. When once the tables of Cassini (1668) had supplied the needed facilities, further progress was assured, and that France, now at the height of her political power, took the lead in the reform, is an instance out of many of the impetus given to geography and allied studies by political conquests.

The new data obtained through the labours of the French academicians—Cassini, Picard, De la Hire, and others—were at first incidental to more strictly astronomical work, but reliable longitudes were gradually accumulated, while the surveys for the new map of France led to progress on geographical lines. The expedition for the determination of the longitude of Cape Verde in 1682 was the first undertaken by the academy for purely geographical purposes. The work of the Jesuits also helped, and the *Connaissance des Temps* could report in 1691 that 109 fixed positions were available. The first *modern* map, that of 1682, was constructed on the principle of reducing all the old longitudinal distances in the proportion deduced from such newly fixed points, and the result was on the whole satisfactory. Only twice more, before Delisle, was any practical attempt made to utilize the new material—in the 'Neptune François,' and in the maps of Nicolas de Fer—in the latter case with but slight success.

The last part of the memoir puts forward in clear relief the achievements of Delisle, who was able before his death to complete the task he had set himself in beginning his labours. Dr. Sandler discusses his methods and shows how they bore fruit in the accuracy of his results. The accompanying portfolio of reproductions supplies an excellent means of testing the latter, the true outlines of

the continents being shown above the facsimiles on transparent paper. Dr. Sandler shows throughout a full knowledge of his subject, and is to be congratulated on the achievement of an excellent piece of historical work.

THE MONTHLY RECORD.

EUROPE.

The Eruption of Vesuvius.—Among the earliest scientists to visit Vesuvius after the late eruption was Dr. Venturino Sabatini, of the Reale Comitato geologico d'Italia, from whose report the following authentic description of the outburst and its results, sent to us by Dr. Peucker of Vienna, has been taken. The eruption brought to a close a phase in the activity of the volcano which had lasted thirty years, during which period the crater formed in 1872 became gradually filled by the quiet welling up of lava in the interior, only a few of the eruptions making their effects visible externally, though in course of time the piling up of material changed the profile of the summit considerably. Between 5 and 6 a.m. on April 4 a fissure opened on the south-eastern side of the cone at an altitude of 3600 feet, an avalanche of blocks of all dimensions destroying the Albergo Fiorenza, while a narrow stream of lava flowed down a gully of the mountain-side. At 3 p.m. the small lateral cone fell in, and a dense column of smoke rose above the crater, black ashes falling at Naples in the evening. On April 5 a second fissure opened at a lower level, and a lava-stream flowed 2½ miles to within some 500 yards of Bosco Trecase. On the 6th a still more copious stream poured forth, and by midday of the 7th had approached to about 500 yards from Torre Annunziata. By the evening the main crater began to hurl out huge white-hot blocks, with the accompaniment of loud detonations and flashes of light, while at the same time a rain of lapilli and ashes began the destruction of Ottajano and San Guiseppe. Earthquake shocks were felt at Naples and elsewhere. On the 8th the ashes, which continued to fall in great quantities, were reddish-grey, instead of black as at first, and were sometimes so dense as to form a dark pall, rendering artificial light necessary in the daytime. This cloud extended to a distance of 100 miles, while a fall of ashes took place at Venice, Paris, etc. A rough calculation places the total amount of ashes and lapilli which fell at 85 million cubic metres, the place most damaged being Ottajano. The lava-streams occupied a sector of 30°, and evidently had their source at various points of the crater. The three principal ones reached a height of 10 to 12 feet, and in places double this amount. This lava was very rapidly disintegrated, probably because it was formed of a chaotic mixture of irregular blocks and fragments. As regards the more general results, Dr. Sabatini points out that, while lesser outbreaks increase the height of the volcano, a catastrophe like that of April last tends to lower it. Whatever may have been the case in 79 A.D., we know that this was the result in 1631 and 1794, when the cone appeared after the eruptions as if truncated. Similarly, the pointed profile of March last exists no longer, and the present height seems below that of the crater of 1872, though the reduction does not probably exceed 330 feet. Besides this, the whole form and composition of the surface of the mountain have been changed, the old fissures having disappeared, whole sections of the crater wall fallen in, and the whole surface having been covered with a thick layer of ashes. These still retained a high temperature on April 14, and, owing to their loose nature, were constantly slipping downhill or being raised into the air by the wind. Except at the time of the most violent outbursts, the

smoke rose quietly from three fissures in three unbroken columns, accompanied by puffs of smoke much resembling balls of cotton-wool. Owing to their great density, these rapidly fall to the ground, and as the density and weight increase, give rise to the avalanches of hot ashes which have been frequently reported, and of which the occurrence is now definitely established. They are really nothing but the so-called "glowing clouds" of very restricted mobility, and the phenomenon (as had been thought by Prof. Lacroix from his observations of Mont Pelé) may occur whenever the necessary conditions are present, and may occasionally lead to destructive results. These emissions may account in part for the high temperature retained by the ashes, which seems due also to emissions of steam at certain spots. The emission of nitrogen or other poisonous gas seems to have been quite an exceptional occurrence. Although the accounts of destruction were in many cases exaggerated, Dr. Sabatini considers that the damage may be reckoned at certainly over a million pounds sterling.

Glacial Traces in the Steiner Alps.—With a view to the discovery of traces of glaciers in the Ice age, Dr. Roman Lucerna has subjected the interesting group of the Steiner Alps to a searching investigation. The results are published in the *Geogr. Jahresbericht aus Osterreich*, which, after an interruption of several years, now appears in its fourth year, in conjunction with the *Bericht des Vereines der Geographen a.d. Universitat Wien* (Vienna, 1906), under the editorship of Privat-dozents Dr. Alfred Grund and Dr. Fritz Machacek. The group arises on the frontier of the three Austrian crownlands, Steiermark, Carinthia, and Krain, and rounds off the southern calcareous Alps in the east. In Penck and Brückner's great work, "Die Alpen im Eiszeitalter," it is omitted. For the present only traces of the most recent of the four Ice ages of the Alps brought to light by Penck, the so-called "Würmeiszeit," could be demonstrated with certainty. There is, however, no doubt that the character of the glaciation of the Steiner Alps in the Ice age is throughout causally connected with that of the other Eastern Alps. Of peculiar interest is the demonstration that the marked local glaciation of the group has kept altogether apart from the glacier system of the other Alps. In the Ice age the Steiner Alps, with their glaciation, formed an advanced post over against the ice-free land in the east and south. Of the fifteen glaciers which, during the younger Ice age, descended the four principal valleys of the group, two were great composite ice-flows. These, during the period of retreat, resolved themselves into different smaller glaciers. Finally, there were only cirque-glaciers, as to-day there are only snow-beds, lasting through the summer.

Results of the German Census.—The results of the German census, which was taken on December 1 last, represent the total population of the home empire as 60,605,183 persons, an increase of over 47 per cent. since 1871, and of 7·52 per cent. since the census of 1900. A study of the distribution of the increase among the various parts of the empire shows that Prussia, with nearly two-thirds (37,278,820) of the total population, has grown at a greater rate than the rest of Germany, the increase in the number of its inhabitants during the past five years being 8·14 per cent. Growth has been most rapid in the three western provinces in the valley of the middle Rhine—Westphalia (13·50 per cent.), Rhineland (11·74 per cent.), and Hesse-Nassau (9·07 per cent.)—which, with an area of less than one-fifth of that of Prussia, contains nearly one-third (12,124,052) of its population. In the county (Regierungs-Bezirke) of Potsdam there has been an exceptionally rapid increase in the population, the number of inhabitants being returned as 2,327,853, or 20·66 per cent. more than in 1900. The city of Berlin, the population of which is enumerated separately, had last December 2,040,222

inhabitants, an increase of 8·01 per cent. In no province or county of Prussia was there a decline in the population during the inter-censal period, but the growth in the eastern provinces, occupying the sandy North German plain, was below both the average for Prussia and the average for the German Empire. In the province of East Prussia the rate of increase was only 1·46 per cent. (in the previous five years, however, a decline had been registered); in the province of West Prussia it was 5·01 per cent., in the county of Frankfurt (Brandenburg) 1·93 per cent., in the province of Pomerania 3·02 per cent., and in Posen, Silesia, and Prussian Saxony between 5 and 6 per cent. In Hanover the rate of increase rose again to 6·52 per cent., while in German Jutland (Schleswig-Holstein) it exceeded the average, being 8·38 per cent. Outside of Prussia the population of the two great southern kingdoms, Bavaria and Wurtemburg, comprising much of the south-western highlands as well as the alpine foreland of Germany, rose by 5·45 and 6·03 per cent. respectively, and amounted last December to 8,813,154, while the already densely populated kingdom of Saxony, with 4,502,350 inhabitants, had increased its population by 7·14 per cent. In the Grand Duchy of Baden (2,009,320 inhabitants), bordering the right bank of the upper Rhine, the rate of increase was precisely that of the German Empire—7·52 per cent., while in Hesse and Oldenburg it reached 8·14 and 9·77 per cent. respectively, furnishing another instance of the rapidity with which the population is increasing in western and north-western Germany. Among the small states bunched together in the highlands of Central Germany, the rate of increase was comparatively small—mostly 3, 4, and 5 per cent. It is noticeable that in Alsace-Lorraine, the population of which declined from 1871 to 1885, there has been since the latter date a progressive increase in population, the percentage of growth during the past five years being 5·53 and the actual population last December 1,814,626, or 265,000 more than in 1871. The continued tendency of population to accumulate in large cities is illustrated by the returns for the Hanse towns, the increase in the case of Hamburg (free city and state) being 13·89 per cent., in the case of Bremen 17·14 per cent., and in the case of Lübeck 9·38 per cent. The male population of Germany (29,868,096) is still slightly less than the female population (30,737,087); but, taking the empire as a whole, the proportional increase in the former (7·68 per cent.) has been slightly in excess of the increase in the latter (7·36 per cent.).

The Topography of Numantia.—A careful investigation of the topography of Numantia has lately been carried out by Prof. Adolf Schulten, who publishes the results in the *Transactions of the Royal Scientific Society of Göttingen* (vol. 8, No. 4, New Series, philologico-historical class). The memoir, which fills 112 quarto pages, reconstructs in large measure the Iberian Numantia, its buttresses, cofferwork walls, fortifications, site of town, population, temple, wells, coins, handmills, etc. It also restores in great part the topography of the famous siege circumvallation of town, camps, strongholds, curtains, wall, moat, signal towers, etc. These points are brought home by three maps and eleven plans. So much having been accomplished, the Academia de Historia will, Prof. Schulten hopes, complete the excavations they began in 1861, and so contribute to the elucidation of Iberian antiquity and of Roman warfare in the time of Scipio and Polybius, doing for Numantia what Napoleon III. did for Alesia. The name of Numantia the author traces through Roman, mediæval, and later literature, showing how in the progress of the centuries the views about the famous city underwent modification and correction. The first serious endeavour, however, to fix its topography was made by Edoardo Saavedra. While in the province of Soria, superintending the building of roads and exploring the Roman roads, he, in 1853, made

the first methodic excavations, but, from want of funds, confined to the immediate environment. His treatise of 1861 induced the Academia to extend the excavations. The commission entrusted with the conduct of the undertaking concludes its report with, "que sin interupcion se continuen los trabajos emprendidos en el Cerro de Garray." In 1886 there was in Soria a great commemoration festival, and the hill of Numantia was bought in order to rescue the remains of the historic town from the peasants of Garray. The peasants all the same continue to turn to account, as a stone quarry, the city hallowed by great memories and sung by national poets. To Prof. Schulten has been reserved the merit of rescuing for the world the geography of a great historic action.

ASIA.

Russian Glaciers.—M. J. Shokalski has collected notes on glaciers within the Russian Empire made by travellers during the years 1902 and 1903, and has published them in the *Izvestiya* of the Russian Geog. Soc., vol. **40**, No. 4. The glaciers of the Caucasus, the Tian-shan, of Munku-Sardik, and the Ala-taus have been investigated, and several new discoveries are recorded. On the southern Tuyuk-su glacier, in the neighbourhood of Verni, measurements of the movement of the ice were made by Mr. S. Y. Dmitriyef in the month of August. The ice moved 214 mm. (about 8½ inches) in twenty-four hours, and at this rate it would take not less than forty-five years for particles of the snowfield to reach the foot of the glacier.

Dr. M. A. Stein's New Expedition to Central Asia.—Dr. Stein, whose excellent archæological and geographical work in Central Asia is well known to readers of the *Journal*, has just started on a new expedition, with the object of extending his researches in the same region. Dr. Stein's project, though only now taking definite shape, was formed some two years ago, before any of the expeditions now in the field with similar objects were in contemplation; and so far back as September, 1904, an application was addressed by him to the Indian Government for its sanction to the proposed resumption of work. It was, however, necessary that, before starting once more for Central Asia, Dr. Stein's official report on the results of the earlier journey should be ready for press. Thus, although the co-operation of the Government, and a generous grant towards expenses from the trustees of the British Museum, were obtained, it was only on the final completion, a month or two ago, of that report (to be published by the Clarendon Press under the title 'Ancient Khotan') that he was able to bring his long-meditated project to a head. Dr. Stein is proceeding to Chinese Turkestan *viâ* Chitral, Wakhan, and the Pamirs, and he hopes to resume his explorations along the southern edge of the desert, afterwards extending them further east towards the westernmost confines of China. He will endeavour to make use of any opportunities that may offer for exploratory work of a geographical nature in or near the regions visited for archæological research, and his efforts in this direction will be reinforced by the services of Rai Ram Singh, the native surveyor who accompanied him on his former journey, which have again been placed at his disposal by the Survey of India Department. Writing from Sarhad in Wakhan on May 19, Dr. Stein reported that, in spite of the abnormally heavy snowfall of the present year, he had successfully crossed the difficult Lowarai pass (10,200 feet) on May 4, though it is likely to remain closed for normal traffic far longer than usual. During his rapid march through Chitral and Mastuj, he had made an interesting study of ancient Buddhist rock-carvings, survivals of Indian architectural ornament, and pre-Mohammedan sites, including that of the old chief settlement of Mastuj, mentioned in Chinese annals. Since the British pacification of the country, the incipient pressure of population is leading to the re-occupation of

patches of arable land in places where cultivation had ceased for centuries. Chitral is an important field to the ethnographer, owing to the shelter it has given to tribes unable to hold their own elsewhere, and the exact anthropological measurements which Dr. Stein was able to make will be of great value. He says that the physical affinity between the "Dards" of Chitral and the Iranian hill tribes on the upper Oxus is as marked as the linguistic. An ascent to the Darkot pass (*circ.* 15,400 feet) showed that the topographical details given in the Chinese account of an invasion of Yasin and Gilgit in 749 A.D., agree remarkably well with the route from Sarhad across the Baroghil saddle to the pass mentioned. Dr. Stein received the most cordial assistance from the Afghan authorities in Wakhan, without which the crossing of the Baroghil pass would have been a matter of difficulty owing to the heavy and soft snow. He hoped, during his stay in the country, to be able to elucidate the early Chinese records and to make a survey of the ancient forts, etc., which still survive. All who are acquainted with Dr. Stein's previous work will feel confident that valuable results may be expected from this new expedition.

Austrian Explorations in Asia Minor.—The Austrian archæological excavations on the site of the ancient Ephesus, conducted by Benndorf at Ajasoluk, were supplemented in the autumn of 1905 by physio-geographical investigations carried out by Dr. Alfred Grund, of Vienna. In the territory of the mouth of the Kuchuk Menderes, or Little Mæander, the archæologists had themselves lighted upon traces of advance of the coasts within historic times amounting to the extraordinary distance of 5 miles. Dr. Grund has now, in general, confirmed the authenticity of this finding. On the other hand, by ascertaining causes and the sequence of the epochs at which the respective advances happened, Dr. Grund has notably supplemented the discovery. There is no longer any deposition by the river; on the contrary, the river empties its alluvium into the Ægean sea at the Gulf of Scalanova to the north-east of the island of Samos. There the alluvium is seized and dragged into the coastal current. The accretion of land follows by purely marine agency, through the formation of new beach-walls. Nearly 2 miles above its mouth the river begins to run between such marine beach-walls. An examination of the ancient building-works, in their relation to the different types of the land formation, yielded the fact that since the beginning of the Christian era the accretion of land must have been effected solely by the agency of the sea. The interior part, on the other hand, of the former bay of the sea penetrating deeply between mountains, has, to a length of over 3 miles, been filled up by the river. This delta, too, must have been formed in the short period of the last seven centuries B.C. The subterranean water of Ajasoluk is still at this day saline. The cause of so great a rate of deposition can be ascribed only to a sinking and subsidence of the valley immediately preceding the historic age. Within the historic age there can have been no further vertical displacement.

The Sakas of the Old Persian Empire.—Among the peoples which formed part of the Persian Empire under Darius were included the Sakas, frequently mentioned by Herodotus and in the inscriptions of Darius, though without any certain indication of their dwelling-place. The subject has been frequently discussed by commentators, but has not yet been quite satisfactorily disposed of, so that a re-examination of the data by Mr. F. W. Thomas, in the *Journal of the Royal Asiatic Society* (January, 1906), is of some interest. The question is complicated by the fact that the name Σάκαι is not always used of precisely the same people, but has a more or less generic sense as applied to various groups of "Scythians." One branch is spoken of as "Sakas beyond the sea," *i.e.* dwelling in Europe. Previous writers have thought that the Asiatic Sakas mentioned in

the geographical enumerations of Darius dwelt in the far north-east of the Persian Empire, possibly in the mountainous country about the sources of the Oxus and Jaxartes, but in this case a difficulty is caused by the mention of a "sea" crossed during Darius' campaign against the Sakas. Mr. Thomas suggests that this sea was the Hamun lake, in the vicinity of which was the Sakastana of Isidor of Charax (time of Augustus), though it has been supposed (on quite insufficient grounds, Mr. Thomas holds) that the settlement of Sakas in the modern Sistan dates only from the end of the second century B.C. In favour of this writer's view is the fact that the Sakas are associated by Darius with the Makas (people of Makran), while, as Gedrosia is not mentioned in the enumerations of Herodotus or Darius, the area covered by Sistan would be entirely omitted unless represented by the country of the Sakas. Mr. Thomas thinks that in ancient times the whole mountain region as far south as Sistan was, in fact, "Scythian," a term which seems to be used generally of people of nomadic habits. Mr. Thomas notes that the idea of early Sakas about the Hamun lake is not entirely new, but it had previously been reached by a totally different line of argument.

The Russian Expedition to the Khatanga.—This expedition (*Journal*, vol. 25, p. 564; vol. 26, pp. 86, 332), has completed its labours and returned to St. Petersburg. Its result has been materially to alter the delineation on the map of the courses of the Khatanga and its branches, and of the various lakes of the region, some of which have no existence as hitherto shown. Ethnographical and zoological observations have also been made.

AFRICA.

Condensation from South-East Clouds on Table Mountain.—We alluded, a year or two ago (vol. 24, p. 96), to experiments carried out on Table mountain by Dr. Marloth with a view to ascertaining the amount of water-supply which might be due to the condensation of the moisture from the south-east clouds on the surface of vegetation, as distinct from the actual fall of rain. The figures obtained were so large as to induce a doubt as to the trustworthiness of the results, it being pointed out that an isolated group of reeds, such as were used by Dr. Marloth, might capture a large amount of moisture, but that in the case of a more extended covering of vegetation the outer row of plants might screen those behind and impede their action. Further experiments have, therefore, since been made and are described by Dr. Marloth in the *Transactions* of the South African Philosophical Society (vol. 16, 1905, part 2). Several gauges with reeds were employed, one being placed in the open as before, while others were placed in the midst of closely growing bushes or reeds. The results proved that, while a considerable screening effect is exercised by the outer rows of bushes, especially during short periods of cloudiness, the quantity which did reach the sheltered gauges during longer periods of south-east clouds was far in excess of the total rainfall for the corresponding period. It is not, however, correct to assume that the difference between the records of a gauge with reeds and one without is wholly due to condensation by the reeds, for it was ascertained that during rain the gauge with reeds collects much more water than the ordinary one, but that the most pronounced difference occurs during misty rain, which shows how effective vegetation is as compared with bare ground in capturing moisture apart from real rain. Dr. Marloth endeavours to show by calculations that the amount of moisture available in the south-east clouds must be far more than many miles of reeds could ever capture, the soaking effect of these clouds being exceptionally great as compared with those from other quarters.

Population of Morocco.—In the May number of *La Géographie* appears an interesting series of extracts from a number of letters that have been addressed to a member of the Paris Geographical Society by Captain N. Larras, a French officer who has been detached for service in Morocco since 1898, and who has chosen this means of making known the results of a very careful investigation he has made into the size and distribution of the population of Morocco. Previous estimates have differed greatly; the totals adopted by Erckmann and Rohlfs, 8,000,000 and 6,500,000 respectively, exceed some enumerations and are greatly exceeded by others. But by extensive personal observations, by a study of the personal observations of other travellers, and by judicious inquiries among the Moors themselves, Captain Larras has arrived at results which he considers to approximate more closely to the truth than it has been possible for earlier estimates to do. He distinguishes between three regions of Morocco: (1) Atlantic Morocco, from Tangier to Mogador; (2) the Atlas-Riff country, with which is included the valley of the Muluya draining into the Mediterranean and the valley of the Sus descending to the Atlantic; and (3) the Saharan borderland. The first region comprises most of the large towns, including Fez and Marrakesh, and may be described in general terms as a fertile, well-populated country; but here, as elsewhere in Morocco, the distribution of the population is very unequal, so unequal, indeed, that Captain Larras affirms that between any two points 100 kilometres apart it is possible to journey by alternative routes so chosen that along one the country will appear two or three times as rich as along the other. After carefully estimating the population district by district, tribe by tribe, city by city, Captain Larras has arrived at the conclusion that the number of inhabitants in this region is about 2,200,000. As regards the mountainous zone, the *diara*, or tribes of the *dir*, *i.e.* of the country at the foot of the Atlas, occupy fertile lands, and are fairly rich and numerous; but among the mountains the valleys are narrow and afford shelter to only a very scanty population living in the *chur* (singular *char*), or unfortified hamlets which line the river-banks. Thus Captain Larras estimates the population of the Atlas-Riff country at no more than 1,500,000, and adding 200,000 inhabitants for the valley of the Muluya and a like number for the Wad Sus and the country stretching south as far as but not including the Wad Draa, he arrives at 1,900,000 as the total population of the second of the three regions he distinguishes. The third region, stretching from the southern slopes of the Atlas into the Sahara, comprises the valleys of the Wad Draa, the Wad Ziz, and part of the Wad Gir. Save for a few nomad and robber tribes, the inhabitants of this region are collected in the *ksur*, or fortified villages along the lines of the streams of water that flow above or below ground. To the basin of the Wad Draa Captain Larras assigns a population of from 100,000 to 250,000; to the basin of the Wad Ziz (including Tafilelt) from 120,000 to 200,000; and to the Wad Gir, together with Figig, from 20,000 to 30,000. According to this estimate, the maximum figure for the population of the Saharan borderland of Morocco is under 500,000, so that in the three regions enumerated by Captain Larras the total population would be at most 4,600,000. Contenting himself with the conclusion that the population of the country lies somewhere between 4 and 5 millions, Captain Larras expresses his own conviction that the right number is nearer the smaller total. It is to be noted, however, that in the early part of his study of the question Captain Larras declares himself of opinion that, in spite of a heavy infant mortality and the number of deaths from violence, the population of Morocco ought, under no worse conditions than have prevailed during the nineteenth century, to be on the increase.

AMERICA.

The Adirondacks.—An instructive paper on "The Physiography of the Adirondacks," by Prof. J. F. Kemp, appeared in the March number of the *Popular Science Monthly* (New York, 1906). The area dealt with, which lies in the northern part of the state of New York, is mountainous to the east, but has more of the character of a plateau (though with minor irregularities of surface) to the west. Geologically it consists of a core of crystalline rocks of pre-Cambrian age, on the flanks of which Cambrian and other Palæozoic strata have been laid down. There is no evidence that any newer rocks were laid down until the advent of the Labradorean ice-sheet of the glacial epoch, though whether the area has always been above the sea from the close of the Ordovician to the present cannot be decided with certainty. The extensive glacial deposits are of much importance, as they have greatly modified the relief and drainage system. The mountains are ranged in distinct north-east and south-west lines, and many of their faces are precipitous; but they cannot be described fully without reference to the valleys, which seem to be of two distinct types. An older series probably dates back in part even to pre-Cambrian time. These valleys have gentle slopes and wide openings, and their softened contours suggest long-continued erosion and maturity of form. The existing rivers often pass from a valley of this type to one of the other series, which has been superimposed upon the first. It is obviously, according to Prof. Kemp, the result of faulting, and this of no great geological antiquity, all the characters of a Graben-Senkung or rift-valley being often observable. While the main directions of the older valleys are north and south, east and west, the most marked of the series of fault-escarpments which define valleys of the newer type is north-east, to this being due the general trend of the mountains. A second but less marked series of faults runs north-west and south-east, and is the cause of many cross-breaks which form passes across the ranges, and develop sharp shoulders in the main precipices. A minor series trending due north may also be recognized. In the drainage system one of the most marked features is the rectangular bending between north-and-south and east-and-west courses displayed by the upper Hudson and its tributary the Sacondaga, which may be in part due to rearrangements of the older drainage by glacial drift. The ice, which came from the north-east, rode over the highest mountains, and traces of its action may be seen in the form of cirques, etc. In reference to Prof. Kemp's paper, Prof. Davis, in *Science* of April 20, raises the question of the age of the fault systems, pointing out that the precipitous sides of the valleys might conceivably be due, not immediately to faulting, but to differential erosion, which has removed the weaker strata on one side of the displacement. Prof. Kemp, in a reply, is inclined to adhere to his belief in a comparatively late (post-Cretaceous) faulting, and in support of this gives instances where the rift-valleys strike across the general structural trend.

Geography in Peru.—The annual memoir of the Geographical Society of Lima for 1904 (*Bulletin de la Sociedad Geographica de Lima, Memoria Anual y Anexos*, 1904) records much energetic work during the year, and a well-considered attempt to extend the society's usefulness. It was resolved to establish geographical centres to correspond with the society at Lima. Already there is a centre at work at Arequipa, where the Howard observatory offers special facilities; another at Iquitos, and a third at Ancachs, each with a programme of work. The instruments required for fixing the exact positions of the cities in Peru were decided upon by Admiral Meliton Carbajal. The list was submitted to the R.G.S. President for his advice and help, and Mr. Reeves was so good as to give valuable

assistance. The instruments are now expected to arrive at Lima, and a trained geodesist is to be appointed, probably from the United States, to take the observations. The Society has resolved to grant a gold medal every two years to the best scientific explorer within the limits of the republic. In one respect the Peruvian geographers are in advance of ourselves, for they have commenced the formation of a museum. The number also contains a detailed account of the important journey of Baron Erland Nordenskiöld, a synopsis of Peruvian earthquakes, and a table of the political divisions of the republic. The boletin certainly shows that there is well-considered and sustained activity among Peruvian geographers.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Mountain Morphology and Erosion.—In reference to the memoir of Dr. Liez on the distribution of mean elevation in Switzerland (*Journal*, vol. **24**, p. 675), Prof. L. Gobet seeks, in the *Bulletin de la Société Neuchateloise de Géographie* for 1905, to elucidate certain principles which may be brought out by a closer study of Dr. Liez's maps. Chief among these is the relation between distribution of altitude and the work of erosion. This is not necessarily so simple and immediate as might at first sight appear, for, however clearly the actually existing relief may be due to erosion, it is not always easy to determine what events in the past geological history of the particular range, or of alpine mountains in general, may have contributed to the present state of things. Attention has often been called to the general agreement in the altitudes of the highest peaks over considerable areas, and to the fact that the greatest altitudes of all commonly lie towards the centre of the range or of its individual groups, and these points are once more emphasized by the study of distribution of altitude in the Alps. Prof. Gobet is inclined to attribute these facts, in the main at least, to the work of erosion, pointing out how generally the highest summits are found just where the base-level of erosion (which may be taken, for various parts of the Swiss Alps, as that of the different lakes receiving the drainage) is itself highest or most remote. This relation may seem a more or less obvious one, for it is evident that, after the first elevation of a mountain range, erosive agencies will act with greatest force from the outer margins, thus lowering the outer parts first, and bringing about a certain regularity in the ultimate arrangement of the relief. But as greater prominence is often given, especially by the adherents of the peneplain theory, to other possible causes, such as the warping to which the old denuded surfaces is supposed to have been subjected during uplift, it is well that the possible sufficiency of erosion to explain the facts should also be kept in view. In a recent note in the *Bulletin* of the American Geographical Society (suggested by the paper of Mr. Daly, noticed in the *Journal*, vol. **26**, p. 565), Prof. Heilprin expresses doubt as to the general prevalence of the arch-form in mountain ranges, but, while asking for stronger evidence in favour of the peneplain theory than has yet been given, thinks that the problem is more complex than is supposed by some.

German Oceanographical Expedition.—The *Planet*, a new vessel specially built by the German Admiralty for survey work, sailed from Kiel in January last on a voyage to the western Pacific, where she will replace the older *Mowe*. The outward voyage is so arranged that as much scientific research as possible in the departments of oceanography and meteorology may be carried out. Among the points to be specially studied in the Atlantic was that of the conditions in the upper atmosphere, with a view to elucidating the interchange of air between the equator and the "Ross-latitudes." The oceanographical programme includes soundings, determinations of temperature and salinity, study of the bottom

deposits, wave-measurements, and so forth, and the route has been chosen so as to give as good results as possible on these subjects. The commander is Captain Lebahn, and, in addition to the naval officers, several scientists, including Dr. Krämer (known for his work on Samoa), have sailed in the *Planet*, which reached Durban in May. The further route will lead by Colombo, Batavia, and Amboyna to the Bismark archipelago, and, after surveying for a time in the latter, the ship will make a cruise to the Carolines, Mariannes, etc., special attention being devoted to the deep channels which exist to the east of the Philippines and Mariannes. The *Planet* is provided with special apparatus for photographic surveying.

GENERAL.

Testimonial to the late Hydrographer.—It has been decided by the friends of the late Sir William Wharton to establish a memorial in the form of a fund, the annual proceeds of which shall be given, like the Beaufort Testimonial founded in honour of a former hydrographer, to the officer who has passed the best examination in mathematics and nautical astronomy for lieutenant in his year. Contributions towards this object are received by Messrs. Coutts & Co., of 440, Strand, and if the funds collected admit, it is proposed to give in addition a medal with a bust of the late hydrographer.

Dr. von Neumayer.—The veteran German scientist, Dr. Georg von Neumayer, late director of the *Deutsche Seewarte*, who since his retirement has taken up his abode at Neustadt, in the Palatinate, attained the age of eighty on June 21, and the occasion was made the subject of an interesting celebration by his many friends and admirers. The celebration took place on June 16 and 17, the "Festrede" being delivered on the latter day by Dr. S. Günther of Munich, while a dinner was held later in the day. It is proposed, if sufficient funds can be collected, to found a "Stiftung" for the encouragement of research by young geographical students, while arrangements may possibly be made for the painting of a portrait of Dr. Neumayer, to be placed in the Historical Museum at Speier.

The Twenty-seventh Congress of French Geographical Societies will be held this year at Dunkirk, the session being opened on July 29. The Geographical Society of Dunkirk, in whose hands are the local arrangements for the organization of the meeting, will at the same time celebrate the twenty-fifth anniversary of its foundation. An invitation to be present and to contribute papers or discussions, is cordially extended to members of our Society.

International Seismological Association.—We are informed by Dr. Gerland, the director, that the central bureau of this association, founded at the second International Earthquake Conference at Strassburg in 1903, is now fully equipped and in working order in that city. The installation consists of the most approved instruments, by which a complete series of observations will be made, the seismograms being preserved for future reference, and made available for students who may visit the bureau. It is asked that information be sent regularly to the bureau (the address of which is 10, Schwarzwaldstrasse, Strassburg, in the same building as the Central German Seismological Station) regarding observations taken in other countries represented by the association.

Course on Oceanography at Bergen.—As in former years, a course of instruction in oceanography is being organized at Bergen for the University vacation of the present summer (August 8 to October 15). It will include both lectures and practical work, covering most of the branches of oceanographical research, and the fee charged is about four guineas. All wishing to attend the course are instructed to apply at once to the Oceanographical Institute of Bergen Museum, Bergen, Norway.

OBITUARY OF THE YEAR.

The following is a list of the Fellows who have died during the year 1905-1906 (April 30):—

John Adams; Sir A. J. Adderley; W. J. d'E. Andrews; Captain E. Ball; T. J. Barnardo; Dr. Alfred Barton; Alexander Begg; Dr. W. T. Blanford; G. C. Bompas; James Bonwick; Major W. A. Boulnois; Colonel M. Bowie; Admiral Lindesay Brine; Captain R. J. W. Bristow; G. W. Brocklehurst; James R. Brown; J. Russell Buckler; A. H. Cane; Thomas Christie; Charles Churchill; John Cohen; Captain Claud Clark; Henry Clifford; Admiral the Hon. A. Cochrane; H. Harper Crewe; A. C. S. Draper; Cairns Deas; Sir Mountstuart E. Grant-Duff; George A. Everitt; Sidney Fleming; John Beach Fleuret; Colonel Sir John Farquharson; Colonel O. B. Fielden; Lieut.-Colonel A. Feez; Sir A. C. Gregory; Colonel F. C. T. Gascoigne; Thomas Greer; F. Gaskell; S. H. Hinde; J. McAlister Hall; Rev. H. W. Hussey; F. J. Horniman; Henry George Hollingworth; Colonel L. H. L. Irby; N. Lloyd Jones; J. M. C. Johnston; J. W. Johnston; E. Powell King; Philip King; H. F. Keep; J. F. Kane; P. C. Leckie; Lieut.-Colonel A. B. Loder; Rev. J. R. Langler; Commander W. M. Latham; Jas. A. Marshall; C. E. Mathews; E. M. Marcoso; Captain W. D. McSwiney; Rev. D. S. McClean; Sir G. G. Petre; H. G. Parsons; F. A. P. Pigou; M. Elisée Reclus; Sir P. N. Russell; Baron von Richthofen; C. S. Roundell; John Rudd Rainey; Colonel H. A. Sanford; Victor Streich; General A. A. Stewart; Dr. J. F. Stewart; Rev. Haskett Smith; James Tees; Charles Twite; W. Tufnell; Coutts Trotter; Robert Taylor; Michael Williams; Major von Wissmann; G. A. Witt; Lieut. G. M. Wheeler; Captain J. Wiggins; Admiral Sir W. J. Wharton; Sir Charles Wilson; George Weller; Captain G. Williams-Freeman; Norman Wrigley.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1905-1906.

Anniversary Meeting, May 21, 1906.—The Right Hon. Sir George T. Goldie, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

The Secretary read the Minutes of the last Anniversary Meeting, which were confirmed and signed by the President.

The Secretary read a list of the newly elected Fellows, and announced that there were eleven candidates for election.

Elections.—*C. A. Barron; John Arthur Cooper; O. S. Crewe-Read; Thomas Henry Davies; Arthur Wesley Dixon; Captain Oswald Arthur Gerald Fitzgerald; Captain Arthur St. Leger Glyn; Thomas Hamilton; John Hastings; Hyam Marks; Dr. William Michaelis; Robert Alexander Morrow; Arnold L. Mumm; Captain John W. Murray; Wm. Nicholson; Charles Russell; Reginald Schomberg; Captain E. de H. Smith.*

The Presentation of the Medals and Other Awards.

The President (addressing Baron Clauzel, representing the French Embassy): M. le Baron, the Founder's Medal of the Royal Geographical Society has been awarded, with the approval of His Majesty King Edward, to M. Alfred Grandidier,

and as this savant, who is of advanced age, has been unable to come to England, His Excellency the French Ambassador has been good enough to depute you to receive the medal and to cause it to be conveyed to M. Grandidier. You, M. le Baron, are aware that M. Grandidier is one of the leading scientific men of France, and that he has rendered special services to geography. From 1857 to 1865 he travelled extensively in the Argentine, Bolivia, Brazil, Chile, and Peru, and also in India and Ceylon. Since 1865 M. Grandidier has devoted his life to the thorough exploration of the island of Madagascar, and to the publication of the results of this exploration, which include physical geography, geodesy, geology, and natural history in all its branches. His explorations enabled a valuable map to be made of the coast of Imerina, and of the central province of the Hova kingdom. In 1875 he began, with the co-operation of various savants, the publication of his great 'Histoire Physique Naturelle et Politique de Madagascar,' which, when completed, will form over fifty large quarto volumes. Altogether M. Grandidier's life-work has been of the highest value in scientific geography, and it forms the basis of our geographical knowledge of the island of Madagascar, which covers an area considerably larger than that of France itself. M. le Baron, in the pursuit of knowledge the Royal Geographical Society admits no distinction of race or nationality, but I think we may be permitted to feel especial pleasure in conferring this medal on the citizen of a country which has always been so thoroughly in the vanguard of geographical exploration as has been France. I now have the honour, M. le Baron, of handing you the Founder's Medal of the Royal Geographical Society, and I beg you to be good enough to transmit it to M. Grandidier with our best wishes.

Baron Clauzel briefly acknowledged the medal.

The PRESIDENT: Dr. Robert Bell, the Royal Geographical Society, with the approval of His Majesty the King, has awarded you the Patron's Gold Medal. You have been, until recently, the acting director of that Geological Survey of Canada which has, amongst its varied labours, done such magnificent geographical work in the Dominion. During forty-five years of field-work you have explored or mapped out so many areas of Canada that I have difficulty in reciting or even recalling more than the leading features of your varied work. Your surveys or explorations include the Gaspé peninsula, the coast of the Labrador peninsula, part of the coast of Baffin Land, and also of Hudson bay with some of its large islands, lakes and rivers innumerable, including the Nelson river with its tributaries, and the north shore of the St. Lawrence. You were in all the expeditions sent by the Canadian Government to Hudson strait and bay, and you were the geologist and naturalist of the *Neptune*, *Alert*, and *Diana* Expeditions. I understand you have written over two hundred Reports of various scientific explorations on different subjects; it is therefore with great pleasure that I now hand you the Patron's Gold Medal, as a Canadian who has done more than any man living to extend our knowledge of the vast areas of the Dominion.

Dr. ROBERT BELL: I find it quite impossible to adequately express my thanks for the great honour which this Society has conferred upon me in awarding me this beautiful medal. I may explain, just for a moment, as the President has mentioned it, how I come to be more or less connected with geography as well as geology. I have been connected with the Geological Survey of Canada for forty-nine years—fifty years next March—and during a great part of that time my work has been very largely geographical. As you are aware, fifty years ago the greater portion of British North America was almost unknown geographically. It was as little known, perhaps, as Africa at that time, so that it became necessary for us to do geographical as well as geological work. The country is so large that to

an Englishman it is almost impossible to explain what we have to overcome. Our work extends from the Atlantic to the Pacific ocean and from the United States boundary northward as far as America extends, because not only the whole of the mainland north of the United States, but the islands to the north also belong to us, and in late years we have been operating in these parts, so that our work goes northward to Lancaster sound on the east and to Lower Yunkon territory on the west. My own surveys have been everywhere between these regions, and, indeed, if they were marked by lines on the map, they would cover the country with a network for about 1000 miles. A great deal of that country is exceedingly interesting geographically; but the Government has no reason to survey it except for geological purposes, and the surveys have extended to the distance I have mentioned from the comparatively narrow strip of inhabited land all along the American frontier. In that way I have necessarily surveyed, as carefully as possible, a very large part of Canada, and I feel deeply grateful to this Society for recognizing that work. This recognition is of the utmost value to me, as well as a very great honour, and I have again to thank Sir George Goldie and the members of the Royal Geographical Society for having awarded me the Patron's medal.

The PRESIDENT: Prof. Ramsay, the Victoria Medal was instituted by the Royal Geographical Society as a means of recognition from time to time of geographical research in any branch, including, as a matter of course, the applications of geography to history. You, sir, have been engaged for thirty years in research into ancient geography, and you are the acknowledged leader of European thought in that branch of study. Your work in Asia Minor has revolutionized the methods upon which such study is based, and has originated a whole school of students in this country, in France, and in Germany. The assistance which your labours have rendered to the understanding of important sections of ancient history can hardly be exaggerated. The Royal Geographical Society has published one monumental work of yours and many papers, and it is with great pleasure that I now hand you the Victoria Medal.

Prof. W. M. RAMSAY: While I feel deeply the honour which you have conferred upon me to-day, far more deeply than I can express in words, I must confess I feel still more pleased that the plan of exploration and study of ancient life and ancient art, which was formed in Oxford about 1879, which keenly interested many of the leading men in the university at that time, and which I was finally chosen to carry out, has been recognized so complimentarily by your Society. It was originally intended to be an archæological research. My own private tastes and interests turned it into an historical research, and I very soon found, in the process of studying history on the spot, that history rests on a basis of geography—a truth which you in this Society have no need to be informed of. It is like all great truths—practically an axiom, almost a truism; and when it is stated, one wonders that it takes a great part of one's life to learn that the history of man as he stands upon the Earth must be studied in the place on which it rests. This scheme, formed originally among purely classical scholars, and executed by one whose whole training had been classical and whose interests lay entirely in the department of ancient history—this scheme, which in that way is an offspring from the classical school of one of our great universities, has been at last chosen for special distinction by this Society, which represents the most advanced and the most progressive side of study in the whole range of modern investigation. It seems to me a really interesting fact in the present stage of educational controversy that a classical scheme has gained this honour which you have now conferred upon me, and, as I feel also, upon those who founded this scheme

of research. I should only like to add one single word with regard to the death of a member of your Council, through whose advice at first this scheme took the geographical form which it gradually assumed. It happened in the beginning of the year 1880, when my wife and I landed in Smyrna, that Sir Charles Wilson, consul-general in Anatolia, happened to be in Smyrna for one day; and it was meeting with him on that day, and the advice he gave, and the practical instructions and directions he imparted to us, that determined the direction in which our studies and travels and work lay for the following seven-and-twenty years, and it is a matter of the deepest regret to me that his death deprived us of the opportunity of seeing Sir Charles Wilson present to-day to witness the conclusion of the work which he really directed in its first steps.

The PRESIDENT: The Murchison Award has been allotted to Major H. R. Davies, whose services to geography include explorations in the Kachin hills, the Shan States, Yunnan, and Siam from the year 1891 to 1895, and the exploration of trade and railway routes, from 1898 to 1900, in Yunnan and Se-chuan. We owe much of our knowledge of these highly important provinces of China to Major Davies, and the maps which the War Office are bringing out have been compiled by him and are largely based upon his own work. Major Davies, I have the pleasure of handing you the Murchison Award.

Major H. R. DAVIES: I feel very much honoured that anything I should have done should have been thought worthy of this award, but I do not at all wish to take all the credit of the survey work in Western China to myself. It was the work of several hands, and I should like to mention some of my comrades, and I hope I may consider that in giving me this award you have also wished to honour those who worked with me. Two of these, Colonel Manifold and Major Ryder, are already very well known to you. I need hardly remind you that Major Ryder was given a Gold Medal last year, after his journey into Tibet, while Colonel Manifold has read papers to this Society on his two journeys in Se-chuan. I should also like to recall to your memory the name of the late Captain Watts Jones, who, I am sorry to say, in a subsequent expedition lost his life in his zeal for exploration in China. I think those who know the work he has done will agree with me that geographical exploration has suffered a great loss in his early death. Others who worked with us, and who are responsible for a large part of the survey in Western China, are Major Pottinger, R.A., Captain Hunter, R.E., and Mr. Ker, C.E. I should remark that a great deal of the actual work was done by native surveyors of the Survey of India, and I think all who know their work will consider this a guarantee that it was well done. Two other travellers I should like to mention who travelled independently of us and did a great deal of survey work—Captain Fraser and Captain Rigby. They both filled in a large part of the southern portion of Yun-nan. I thank you again for the great honour you have done me.

The PRESIDENT: I have to announce that the recipient of the Gill Memorial, Major A. St. Hill Gibbons, is in South Africa at this moment, consequently we shall have to retain the Gill Memorial for him until he comes home. I will only mention his services to geography in the important exploring and survey work he did in Barotseland on his two expeditions in 1895-6 and 1898-1900. Major Gibbons's map, published in the *Geographical Journal*, shows clearly that for our geographical knowledge of northern Rhodesia we are largely indebted to his careful and conscientious work. At the close of his last expedition in Barotseland, Major Gibbons, practically single-handed, made a route survey, checked by observed latitudes, north to Uganda by Lakes Tanganyika, Kivu, and Albert Edward.

The recipient of the Cuthbert Peek Grant, Major Austin, is also absent—in India. After being employed on the Indian trans-Frontier Survey of 1890-1, he

assisted in the preliminary survey of the Uganda railway in 1891–2, and he explored the Lake Rudolf region when serving with Sir R. Macdonald in 1897. He carried out a survey of the Sobat region in 1899–1900. He also carried out an important and hazardous expedition from Ordurman to Mombasa in 1900–1, and the result of these various expeditions were of the highest geographical value. The Cuthbert Peek Grant will be given to Major Bright to convey to Major Austin.

Major Bright has been for six and a half years exploring in the Egyptian Sudan, in Uganda, and in East Africa. The Sobat and Rudolf regions were explored by him under Major Austin in 1900–1. In 1902 he worked under Colonel Radcliffe on the Anglo-German Boundary Commission, and in 1904–6 he worked under Colonel Smith on the Anglo-German Boundary Commission east of Lake Kilimanjaro, and for all these services to geography which I have so briefly recited, but which he has carried out so admirably, he has been awarded the Back Bequest.

Major R. G. T. BRIGHT: I need hardly assure you that I appreciate most highly the honour you have bestowed on me this afternoon in granting me the Back Bequest. To receive this recognition while still in the enjoyment of one's full working powers is a great inducement to continue in the paths of geographical research. I have had the good fortune always to serve under the able leadership of officers well known for their geographical work in Africa. I think it is only right I should take this opportunity of mentioning their names. Sir Ronald Macdonald—no words of mine can add to his reputation as a geographer and military commander; Major Austin, who has just had the honour of receiving one of the Royal Geographical Society's awards; Colonel Delmé-Radcliffe; and Captain Smith. I express once more my gratitude towards the Society.

The President then delivered his anniversary address (see p. 1).

After the visitors had withdrawn, the President appointed as scrutineers Mr. W. M. Corner and Captain Slack.

The Report of the Council was then read; it will be published in the next Year-book.

The PRESIDENT: I have to announce that the ballot papers have been gone through by the scrutineers, and the entire list proposed by the Council has been adopted by the Fellows of the Society without any objection whatever or alterations.

The list is as follows, the names of new members, or of those changing office, being printed in *italics*:—

President: Right Hon. Sir George D. Taubman Goldie, K.C.M.G., F.R.S., D.C.L., etc. *Vice-Presidents:* Sir H. E. G. Bulwer, G.C.M.G.; Colonel G. Earl Church; *Right Hon. Lord Curzon of Kedleston*, G.C.S.I., G.C.I.E., etc.; *Douglas W. Freshfield*; Colonel D. A. Johnston, C.B., R.E.; Sir Clements R. Markham, K.C.B., F.R.S., F.S.A. *Treasurer:* Edward L. Somers Cocks. *Trustees:* Right Hon. Lord Avebury, D.C.L., F.R.S.; Lord Belhaven and Stenton. *Hon. Secretaries:* Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary:* Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors:* Admiral Sir Nathaniel Bowden-Smith, K.C.B.; Major Chas. F. Close, C.M.G., R.E.; Captain Ettrick W. Creak, C.B., F.R.S., R.N.; F. H. H. Guillemard, M.A., M.D.; Sir Clement L. Hill, K.C.M.G., K.C.B., M.P.; *Colonel Sir Thomas Hungerford Holdich*, K.C.I.E., C.B., R.E.; Sir Harry H. Johnston, G.C.M.G., K.C.B.; *Sir George S. Mackenzie*, K.C.M.G., C.B.; Admiral Sir Albert Hastings Markham, K.C.B.; *John L. Myres*, M.A.; Right Hon. Sir J. West Ridgeway, K.C.B., G.C.M.G., K.C.S.I.; *Howard Saunders*, F.L.S.; Captain R. F. Scott, C.V.O., R.N.; Colonel Sir Colin C. Scott-Moncrieff, K.C.M.G., K.C.S.I., R.E.; General J. H. M. Shaw Stewart, F.R.S.E., R.E.; Colonel Hon. M. G. Talbot, R.E.; *H. Yates Thompson*; Colonel Sir Henry R. Thuillier, K.C.I.E., R.E.; *Prof. W. W. Watts*, F.R.S.; Commander David Wilson-Barker, R.N.R., F.R.S.E.; *Colonel C. E. Yate*, C.S.I., C.M.G.

THE ANNIVERSARY DINNER.

The Anniversary Dinner took place in the evening at the Whitehall Rooms of the Hôtel Métropole. Sir George Goldie, the President, was in the chair, and among those present were Dr. Nansen, Lord Portsmouth, Lord Strathcona, Colonel Sir T. Holdich, Admiral Sir A. Markham, the Dean of Westminster, Sir A. Binnie, Mr. Douglas Freshfield, Colonel Sir C. Scott-Moncrieff, Sir Eric Barrington, Sir M. Ommanney, Mr. Ridgely Carter, Sir G. S. Mackenzie, Admiral the Hon. Sir E. R. Fremantle, the Hon. J. W. Taverner, Mr. R. L. Antrobus, Vice-Admiral Sir J. Bruce, Mr. Moberly Bell, Mr. Walrond Clarke, the Hon. W. Pember Reeves, Sir Harry Johnston, Colonel the Hon. M. G. Talbot, Mr. T. A. Coghlan, Mr. H. Yates Thompson, General Shaw Stewart, Colonel C. E. Yate, Mr. Dobson, Captain F. W. Creak, Mr. Vernon Magniac, Captain O'Connor, Major C. F. Close, Mr. Tudor G. Trevor, Captain W. F. O'Connor, Major L. Darwin, Mr. J. F. Hughes, Mr. E. L. S. Cocks, Major-General Sir T. Fraser, and Colonel Sir C. M. Watson.

After the toasts of "Our Patron, the King," and "Our Vice-Patron, the Prince of Wales," the PRESIDENT proposed the toast of "The Army and Navy," to which the Earl of Portsmouth and the Admiral the Hon. Sir E. R. Fremantle responded.

Sir HARRY JOHNSTON proposed "The Medallists," for whom Dr. ROBERT BELL, F.R.S., and Prof. W. M. RAMSAY responded.

Major L. DARWIN gave "The Guests."

Dr. NANSEN said, in responding, that he felt it to be a very great honour to be the guest of the leading Geographical Society of the world. Geographical explorers had conquered the world, but he hoped they were not going to take their ease. A great many men of great ability had been too much tempted to make records, and had not taken enough trouble to make thorough exploration. They had now got rid of that curse. There was a little temptation left to make records in the polar regions, but there was very little in the rest of the world, and now was the time for scientific geographical exploration. In oceanographical exploration we were very far from being up to the mark in comparison with the strides made by the sciences on *terra firma*. In other directions, also, there was much to be done.

Sir ALEXANDER BINNIE and the Hon. J. W. TAVERNER also responded. The toast list concluded with the toast of "The President and the Society," which was submitted by the Dean of WESTMINSTER and acknowledged by Sir GEORGE GOLDIE.

Fourteenth Meeting, June 11, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., F.R.S., President, in the Chair.

ELECTIONS.—*Hamilton Baly, M.A.; Chas. Bampfylde; Lord Basing, C.B.; Lieut.-Colonel Chas. Forbes Blane, R.H.A.; Colonel H. Burnly-Campbell, late 6th Dragoon Guards; Read Crewe; F. D'Almeida; John Horace Fry; Captain Terence Keyes, I.A.; Innes Harold Stranger; Colonel F. H. Ward, late R.A.; Harry Owen White; Edward Neale Wigg.*

The paper read was:—

"The Geography of the Indian Ocean." By J. Stanley Gardiner, M.A.

Fifteenth Meeting, June 18, 1906.—The Right Hon. Sir GEORGE T. GOLDIE, K.C.M.G., D.C.L., F.R.S., President, in the Chair.

ELECTIONS:—*Edgar Pierce Allen; Colonel A. C. Bailward (late R.A.); John George Barkley; C. W. A. Bumu; George Carter, M.A.; Herbert Lloyd*

Chittenden; Charles T. Currelly, M.A.; R. Davies; Wm. Mitcheson Dodd; Archibald D. Douglas; Captain G. Drage; John Gaskin Dunlop, M.A.; E. F. Elton, M.A.; George Goss; Edwin Greenacre; Charles Walter Grimwade; Captain John Havington (Rifle Brigade); John Harris; Hugh L. Heber-Percy; Daniel Wilkinson Iddings; Andrew S. Iddings; Andrew D. Lord; S. F. B. Martin; Henry W. Maynard; Dr. Edalj M. Modi; Frederick Morrow; Captain C. C. Newnham (6th King Edward's Own Cavalry); H. A. Ottewill; T. Comyn Platt; Walter Thomas Taylor; W. L. O. Twiss; Leslie Urquhart; Ralph T. Yeates; Captain James Weir.

The paper read was:—

"A Fifth Journey in Persia." By Major P. Molesworth Sykes, C.M.G.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6¼.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Adriatic. **Cori and Merz.**

Jahresb. V. Förderung naturw. Erforschung Adria 2 1904 (1905): 12–38.

Bericht über die im Auftrage des löblichen Vereines zur Förderung der naturwissenschaftlichen Erforschung der Adria im Jahre 1904 ausgeführten ozeanographischen und biologischen Untersuchungen und Arbeiten im Golfe von Triest. Von Prof. Karl I. Cori.

Vorläufiger Bericht über die physikalisch-geographischen Untersuchungen im Golfe von Triest, vom Juli 1904 bis Mai 1905. Von Alfred Merz.

Austria. **Haidenthaller.**

The Saline Ioduretted Springs of Hall-Baths in Upper Austria. By Dr. J. Haidenthaller. ('Illustrated Europe,' No. 182.) Zürich: Art. Institut Orrell Füssli, [1906]. Size 7½ × 5, pp. 36. *Illustrations and Plan. Presented by the Publishers.*

Austria—River-Terraces. *M.R.R.G. Ges. Wien* **48** (1905): 587–591. **Schaffer.**

Bemerkungen zur Frage der alten Flussterrassen bei Wien. Von Dr. F. X. Schaffer.

Balkan Peninsula. **Herbert.**

By-paths in the Balkans. By W. V. Herbert (Captain Frederick William von Herbert). London: Chapman & Hall, 1906. Size 9 × 6, pp. xiv. and 270. *Frontispiece. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Central Europe. **Sommer.**

Die wirkliche Temperaturverteilung in Mitteleuropa. Von Dr. Emil Sommer. (Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. XVI. Band, Heft 2.) Stuttgart: J. Engelhorn, 1906. Size 9½ × 6½, pp. 125–166. *Maps.*

Europe—Communications. *M.K.K.G. Ges. Wien* **48** (1905): 515–560, 592–628. **Doblhoff.**

Europäisches Verkehrsleben (vom Altertume bis zum Westfälischen Frieden). Eine Studie von J. v. Doblhoff.

Europe—Gravity Determination. **Borrass.**

Relative Bestimmungen der Intensität der Schwerkraft auf den stationen Bukarest Tiglina bei Galatz, Wien, Charlottenburg und Pulkowa im Anschluss an Potsdam. Ausgeführt und bearbeitet von E. Borrass. (Veröffentlichung des Königl. Preussischen Geodätischen Institutes, N.F. No. 23.) Berlin: P. Stankiewicz, 1905. Size 10 × 7, pp. 68. *Presented by the Institute.*

Europe—Languages. **Mikkola.**

Öfversigt Finska Vet.-S. Förhandl. **45**, 1902–3, No. 4 (1903): pp. 47.

Baltisches und Slavisches. Von Joos. J. Mikkola.

Faroe Islands. *P.R.S. Edinburgh* **25** (1906): 2–24. **Annandale.**

The People of the Faroes. By Nelson Annandale. *With Sketch-map.*

Faroe Islands. *Scottish G. Mag.* **22** (1906): 61–76, 134–147 **Currie.**

The Færöe Islands. By James Currie. *With Illustrations.*

France. *B.S.G. Com. Bordeaux* **29** (1906): 21–30. **Abrioud and Descombes.**

La Déforestation du sol français. Par L. Abrioud.

Rapport sur le vœu du Syndicat d'initiative de la Savoie. Par Paul Descombes.

France. *C. Rd.* **142** (1906): 184–186. **Glangeaud.**

Une ancienne chaîne volcanique au nord-ouest de la chaîne des Puys. Note de P. Glangeaud.

France—Coasts. *B. de G. Historique et Descriptive* (1904): 439–479. **Pawlowski.**

Les transformations du littoral français. Le golfe de Brouage et le pays marennais à travers les âges, d'après la géologie, la cartographie, et l'histoire. Par M. Auguste Pawlowski.

France—Historical. *B. de G. Historique et Descriptive* (1905): 45–160. **Loisne.**

Catalogue raisonné des cartes et plans de l'ancienne province d'Artois. Communication de M. le Comte de Loisne.

Germany. *T. Edinburgh Geol. S.* **8** (1905): 403–412. **Currie.**

The Stassfurt Salt Industry. By James Currie.

Germany. **Wimmer.**

Geschichte des deutschen Bodens mit seinem Pflanzen- und Tierleben von der keltisch-römischen Urzeit bis zur Gegenwart. Historisch-geographische Darstellungen von J. Wimmer. Halle a. S.: Buchhandlung des Waisenhauses, 1905. Size 9 × 6, pp. viii. and 476. *Price* 8*m. Presented by the Publisher.* [To be reviewed.]

Germany—Bavaria. *M.G. Ges. München* **1** (1905): 313–354. **Rösch.**

Der Kontakt zwischen dem Flysch und der Molasse im Allgäu. Von A. Rosch. *With Map and Plate.*

Germany—Gazetteer. **Neumann.**

Neumanns Orts- und Verkehrs-Lexikon des Deutschen Reichs. Vierte Auflage, herausgegeben von Dr. jur. Max Broesike und Wilhelm Keil. Leipzig und Wien: Bibliographischen Institut, 1905. Size 10 × 6½, pp. 1256. *Maps and Plans. Price* 16*s.* 8*d.*

This standard work, the third edition of which appeared some twelve years ago, has now been considerably enlarged and thoroughly revised.

Germany—Harz. *M.G. Ges. Jena* **23** (1905): 1–7. **Walther.**

Einige wichtigere Ergebnisse der geologischen Untersuchung des Harzgebirges. Von Dr. Karl Walther.

Germany—Hessen. **Hessler.**

Hessische Landes- und Volkskunde. Das ehemalige Kurhessen und das Hinterland am Ausgange des 19. Jahrhunderts. In Verbindung mit dem Verein für Erdkunde zu Cassel und zahlreichen Mitarbeitern herausgegeben von Carl Hessler. Band I. Hessische Landeskunde, Erste Hälfte. Band II. Hessische Volkskunde. Marburg: N. G. Elwert, 1904–1906. Size 9½ × 6½, pp. xii. and 532, and xvi. and 662. *Maps and Illustrations.* *Price* 16*s.* 3*d.*

Germany—Silesia. *Z. Ges. E. Berlin* (1906): 10–38. **Friedrich.**

Die glazialen Stauseen des Steine-Tales bei Möhlten und des Neisse-Tales zwischen Wartha und Camenz, ein Beitrag zur Glazialforschung im Gebiet der oberen Glatzer Neisse. Von E. G. Friedrich. *With Map and Profiles.*

Iceland. *M.K.K.G. Ges. Wien* **48** (1905): 629–630. **Schneider.**

Vorläufiger Bericht über die Ergebnisse einer Studienreise nach Island im Sommer 1905. Von Dr. Karl Schneider.

Italy—Lipari Islands. *M.G. Ges. Hamburg* **21** (1906): 202–205. **Schlee.**

Die Liparischen Inseln und ihre Vulkane. Von Dr. Schlee.

Northern Europe—Lapland. *La G., B.S.G. Paris* **13** (1906): 48–50. **Rabot.**

Actions géologiques des débâcles en Laponie. Par Charles Rabot. *With Illustrations.*

Norway. *La G., B.S.G. Paris* **13** (1906): 43–48. **Rabot.**

Exploration géologique du Sognefjord supérieur. Par Charles Rabot. *With Illustrations.*

Portugal. *B.S.G. Lille* **45** (1906): 48–54. **Quiévreux.**

De la défense naturelle du Portugal et pourquoi la fusion des Portugais et des Espagnols en une seule nation est impossible. Par C. J. Quiévreux.

Russia. *M.G. Ges. Hamburg* **21** (1906): 224–228. **Friederichsen.**

Russland, Land und Leute. Von Dr. Max Friederichsen.

Scandinavia—Earthquake. *M.G. Ges. Hamburg* **21** (1906): 205–207. **Petersen.**

Mitteilungen über die Erderschütterungen in Skandinavien. Von Dr. J. Petersen.

Scandinavia—Historical. *M.K.K.G. Ges. Wien* **48** (1905): 631–633. **Schoener.**

Hat es eine vorskandinavische Einheit gegeben? Von J. G. Schoener.

The writer holds that the peoples of Sweden and Norway were differentiated from the earliest times of the settlement of the peninsula.

Sweden. **Gavelin.**

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The History of the Geography of Scotland. By Sir Archibald Geikie, F.R.S. *With Maps and Illustrations.*
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Seiches observed in Loch Ness. By E. Maclagan-Wedderburn.

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The Rhizopods and Heliozoa of Loch Ness. By James Murray.

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The Canonbie Coalfield: its Geological Structure and Relations to the Carboniferous Rocks of the North of England and Central Scotland. By Dr. B. N. Peach and Dr. J. Horne. *With Map and Sections.*

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The Landslide in the Rhymney Valley. By Prof. W. Galloway.

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The Glacial Deposits of Northern Pembrokeshire. By Dr. T. J. Jehu. *With Plate and Diagram.*
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United Kingdom—Wales. **Smith.**
The Itinerary in Wales of John Leland in or about the years 1536–1539. Extracted from his Manuscripts. Arranged and edited by Lucy Toulmin Smith. London: George Bell & Sons, 1906. Size 9½ × 7, pp. xii. and 152. *Map. Price 10s. 6d. net.*
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United Kingdom—Waterways. **Forbes and Ashford.**
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Tai Yuan fu to Hankow: an Overland Trip in North China. By Prof. R. W. Swallow. *With Illustrations.*

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Le carnet d'un marsouin, Cambodge.

India—Bombay. *Tour du Monde* **12** (1906): pp. 1–48. **Menant.**

Aux monuments bouddhiques et Jaïnas du Girnar (Présidence de Bombay). Par M^lle^ D. Menant. *With Map and Illustrations.*

India—Calcutta. *J.S. Arts* **54** (1906): 275–298. **Buckland.**

The City of Calcutta. By C. E. Buckland.

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Report on the Psychology and Sociology of the Todas and other Indian Tribes. By Dr. W. H. R. Rivers.

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Die Erkundung des Mustaghpasses im Karakorum-Himalaya. Von Aug. C. F. Ferber. (Sonderabdruck aus der Zeitschrift des Deutschen und Osterreichischen Alpenvereins, 1905.) Innsbruck, 1905. Size 10½ × 7½, pp. [20]. *Illustrations and Maps. Presented by the Author.*

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Some Notes on Journeys in Southern and South-Eastern Persia. By Herbert R. Sykes. *With Illustrations.*

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Versuch einer Geographie und Statistik der Tungusenstämme Sibiriens. Nach den Angaben der Volkszählung 1897 bearbeitet von S. Patkanow. [Publications

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Russian Central Asia. *Acta S. Sc. Fennicæ* **25**, p. 1 (1899): pp. 132, etc. **Tallqvist.**

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A propos de la position géographique d'El Oued.

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Der Elefant in Britisch-Ostafrika und Uganda. Von W. Schütze.

Cape Colony. *Quarterly J. Geol. S.* **62** (1906): 70–87. **Schwarz.**

The Coast-Ledges in the South-West of the Cape Colony. By Prof. Ernest H. L. Schwarz. [See June number, p. 629.]

Cape Verde Islands. **Barjona.**

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The Making of Modern Egypt. By Sir Auckland Colvin, K.C.S.I., etc. London: Seeley & Co., 1906. Size 9 × 6, pp. xiv. and 428. *Map and Frontispiece. Price* 18*s. net. Presented by the Publishers.* [Reviewed in vol. **27**, p. 622.]

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See note on the volume of Dr. Genthe's travels dealing with Korea (June number, p. 644).

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Villattes Forschungen in der Sahara. *With Map.*

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A travers l'Afrique Australe. Par M. Jalla. *With Map.*

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Quelques considérations sur le bassin du Tchad. Par A. Schoep. *With Maps.*

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Zur Geologie von Togo und vom Nigerlande. Von Prof. Dr. L. v. Ammon. *With Map and Illustrations.*

Togo. *Globus* **89** (1906): 139–141. **Spiess.**
Bedeutung einiger Städte- und Dorfnamen in Deutsch-Togo. Von C. Spiess.

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United States—Appalachians. **Ayres and Ashe.**
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The Hydrology of San Bernardino Valley, California. By Walter C. Mendenhall. (U.S. Geological Survey, Water-supply and Irrigation Paper, No. 142.) Washington, 1905. Size 9 × 6, pp. 124. *Maps and Illustrations.*

United States—Glacial Epoch. **Alden.**
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United States—Hydrology. **Fuller.**
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United States—Irrigation. **Newell.**
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The Lead, Zinc, and Fluorspar Deposits of Western Kentucky. By E. O. Ulrich and W. S. Tangier Smith. (U.S. Geol. Survey, Professional Paper, No. 36.) Washington, 1905. Size 11½ × 9, pp. 218. *Maps and Illustrations.*

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Final Report on the Survey of the Boundary Line between Allegany and Garrett Counties. By L. A. Bauer. *With Map and Illustrations.*

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Third Report on the Highways of Maryland. By A. N. Johnson. *With Illustrations.*

United States—Missouri. **Bain and Ulrich.**

The Copper Deposits of Missouri. By H. Foster Bain and E. O. Ulrich. (*B.U.S. Geol. Surv.*, No. 267, 1905.) Pp. 52. *With Sketch-maps and Illustration.*

United States—New Mexico. **Keyes.**

Geology and underground water conditions of the Jornada del Muerto, New Mexico. By C. R. Keyes. (U.S. Geol. Survey, Water-Supply and Irrigation Paper, No. 123.) Washington, 1905. Size 9½ × 6, pp. 42. *Maps and Illustrations.*

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The Configuration of the Rock Floor of Greater New York. By W. H. Hobbs. (*B.U.S. Geol. Surv.*, No. 270, 1905.) Pp. 96. *With Maps and Sections.*

United States—Oregon. *American J.Sc.* **21** (1906): 58–66. **Hershey.**

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United States—Pennsylvania. **Stone.**

Mineral Resources of the Elders Ridge Quadrangle, Pennsylvania. By Ralph W. Stone. (*B.U.S. Geol. Surv.*, No. 256, 1905.) Pp. 86. *With Maps and Illustrations.*

United States—Rio Grande. **Slichter.**

Observations on the Ground Waters of Rio Grande Valley. By Charles S. Slichter. (U.S. Geol. Survey, Water-Supply and Irrigation Paper, No. 141.) Washington, 1905. Size 9½ × 6, pp. 84. *Maps and Illustrations.*

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Results of Primary Triangulation and Primary Traverse. Fiscal Year 1904–5. By Samuel S. Gannett. *With Map.*

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Economic Geology of the Bingham Mining District, Utah. By John Mason Boutwell, with a Section on Areal Geology, by Arthur Keith, and an Introduction on General Geology by Samuel Franklin Emmons. (U.S. Geol. Survey, Professional Paper, No. 38.) Washington, 1905. Size 11½ × 9, pp. 414. *Maps and Illustrations.*

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B. Museum Comparative Zoology, Harvard College, Geol. Ser. **8** (1905): No. 2 (pp. 13–56).

The Wasatch, Canyon, and House Ranges, Utah. By W. M. Davis. *With Plates and Illustrations.*

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Cold Water Belt along the West Coast of the United States. By Ruliff S. Holway. (University of California Publications, Bulletin of the Department of Geology, vol. 4, No. 13, pp. 263–286.) Berkeley, 1905. Size 11 × 7. *Charts. Presented by the Author.*

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The Cordillera de Potosi. By Dr. Henry Hoek. *With Map and Illustrations.*

Brazil. *Rev. Trim. I. Ceará* **19** (1905): 282–290. **Brandão.**

Esplanação relativa aos limites do Ceará com o Rio Grande do Norte. Por Matheus N. Brandão.

Brazil—Climate.

Commissão Geographica e Geologica de S. Paulo. Secção Meteorologica. Dados climatologicos do Anno de 1898 (pp. 64); 1899 (pp. 64); 1900 (pp. 86); 1901 (pp. 144); 1908, por N. J. Belfort Mattos (pp. 136). São Paulo, 1899-1904. Size 9½ × 6½. *Maps and Diagrams. Presented by the Commission.*

Brazil—Ethnography. *Globus* **89** (1906): 105–108. **[Koch.]**

Anfänge der Kunst im Urwald. *With Illustrations.*

Brazil and Bolivia. *Quarterly J. Geol. S.* **62** (1906): 88–124. **Evans.**

The Rocks of the Cataracts of the River Madeira and the adjoining portions of the Beni and Mamoré. By Dr. J. W. Evans. *With Sketch-maps and Plate.*

See vol. 27, p. 632.

Guatemala. **Burkitt.**

A Kekchi Will of the Sixteenth Century. By Robert Burkitt. [Reprinted from the *American Anthropologist*, vol. 7, No. 2, April–June, 1905.] Size 10 × 6½, pp. 271–294. *Presented by the Author.*

Paraguay—Historical. **Lozano.**

P. Pedro Lozano. Historia de la las Revoluciones de la Provincia del Paraguay (1721–1735) Obra inédita. 2 vols. Buenos Aires: Cabaut y Cía, 1905. Size 9 × 6½, pp. (vol. 1) xx. and 454; (vol. 2) 546. *Presented by S. A. Lafone Quevedo.*

The manuscript of this work, by the well-known Jesuit historian of La Plata, was offered for sale by Karl Hiersemann of Leipzig in 1890, and acquired by an Argentine savant, being here printed for the first time.

South America—Ethnology. *M.G. Ges. Jena* **23** (1905): 16–34. **Kurze.**

Sitten und Gebräuche der Lengua-Indianer. Nach Missionsberichten von G. Kurze.

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Caroline Islands. *Deutsch. Rundschau G.* **28** (1905–6): 97–106, 150–159. **Seidel.**

Das Atoll Oleaï und seine Bewohner. Ein Beitrag zur Kenntnis Deutsch-Mikronesiens. Von H. Seidel. *With Map.*

Fiji.

Fiji: Great Britain's Colony in the Pacific. ('Star of the Pacific,' No. 1. Christmas, 1905.) Suva. Size 11½ × 9½, pp. 56. *Illustrations.*

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See review, vol. 27, p. 498.

New Guinea. *Deutsch. Rundschau G.* **28** (1906): 166–176. **Van Hille.**

Reisen in West-Neuguinea. Von J. W. van Hille. Nach dem Holländischen. *With Map.*

New Guinea—German. *Globus* **89** (1906): 14–15. **Stephan.**

Anthropologische Angaben über die Barriai (Neupommern). Von Dr. Stephan. *With Illustration.*

New South Wales—Anthropology. **Parker.**

The Euahlayi Tribe: A Study of Aboriginal Life in Australia. By K. Langloh Parker. With an Introduction by Andrew Lang. London: A. Constable & Co., 1905. Size 9 × 6, pp. xxviii. and 156. *Price* 7*s.* 6*d. net. Presented by the Publishers.*

Mrs. Parker gives, from personal study, an excellent account of the manners and customs of one of the least-known tribes of New South Wales, special attention being devoted to the women and children.

Pacific Islands. **Seurat.**

Cours d'Océanographie fondé à Paris, par S. A. S. le Prince de Monaco (Deuxième Année). Les îles coralliennes de la Polynésie. Structure, Mode de formation, Faune et Flore. Par L. G. Seurat. (*B. Musée Océanograph. Monaco*, No. 65, 1906.) Pp. 16.

POLAR REGIONS.

Arctic—Bennett Island. *Globus* **89** (1906): 127. **Koltschak.**

Koltschaks Expedition nach der Bennett-Insel.

Arctic—Ice. *Petermanns M.* **52** (1906): 13-19. **Isachsen.**

Das paläokrystische Eis. Von Gunnar Isachsen.

Polar Research. *Globus* **88** (1905): 380-391. ——

Das Projekt von Mons für die internationale Polarforschung.

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Altitudes. *Alpine J.* **23** (1906): 30-38. **Workman.**

Altitude Measurements by Mountaineers: Practical Experiences with the Watkin Aneroid. By Dr. W. H. Workman. *With Illustration.*

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Service géographique de l'Armée. Rapport sur les travaux exécutés en 1904. Paris, 1905. Size 10½ × 6½, pp. 46. *Maps. Presented by the French Minister of War.*

Geodesy. *Z. Ges. E. Berlin* (1906): 39-52. **Galle.**

Neuere Arbeiten auf dem Gebiete der Erdmessung. Von Prof. Dr. A. Galle.

Surveying and Cartography. *Petermanns M.* **52** (1906): 22-23. **Hammer.**

Landesaufnahme und Kartographie. Von Prof. Dr. E. Hammer.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geomorphology. **Suess and Sollas.**

The Face of the Earth (Das Antlitz der Erde). By Eduard Suess. Translated by Hertha B. C. Sollas, under the direction of W. J. Sollas. Vol. 2. Oxford: Clarendon Press, 1906. Size 10 × 7, pp. vi. and 556. *Maps, Diagrams, and Illustrations. Price* 25*s. net. Presented by the Publishers.*

The first volume was reviewed in June, 1905 (vol. **25**, p. 665).

Hydrography—Tides and Waves. **Wheeler.**

A Practical Manual of Tides and Waves. By W. H. Wheeler. London: Longmans & Co., 1906. Size 10 × 6½, pp. viii. and 202. *Price* 7*s.* 6*d. net. Presented by the Publishers.*

Limnology—Seiches. *T.R.S. Edinburgh* **41** (1905): 599-649. **Chrystal.**

On the Hydrodynamical Theory of Seiches. With a Bibliographical Sketch. By Prof. Chrystal.

Meteorology. **Börnstein.**

Leitfaden der Wetterkunde: Germeinverständlich bearbeitet von Dr. R. Börnstein. Zweite Auflage. Braunschweig: F. Vieweg und Sohn, 1906. Size 9½ × 6, pp. xii. and 230. *Maps and Plates. Price* 6*s.*

Meteorology. *Met. Z.* **23** (1906): 53-67. **Gockel.**

Ueber den Ionengehalt der Atmosphäre. Von A. Gockel.

Meteorology. **Grenander.**

Arkiv. Matematik K. Svensk. Vet. A., Stockholm **2**, No. 7 (1905): pp. 15.

Les gradients verticaux de la température dans les minima et les maxima barométriques. Par S. Grenander. *With Diagrams.*

Meteorology. *Met. Z.* **23** (1906): 82-86. **Hann.**

Der Pulsschlag der Atmosphäre. Von J. Hann.

Meteorology. *Ciel et Terre* **26** (1906): 567-575. **Hergesell.**

L'état actuel et l'avenir de la Météorologie maritime. Par H. Hergesell.

Meteorology. *Monthly Weather Rev.* **33** (1905): 438-439. **Monaco.**

Sounding and Pilot balloons over the ocean. By H.S.H. the Prince of Monaco.

Meteorology. *Mem. y Rev. S. Ci. "Antonio Alzate"* **17** (1902): 53–61. **Moreno y Anda.**
El decrecimiento de la temperatura con la altitud. Por M. Moreno y Anda.

Meteorology. *Petermanns M.* **52** (1906): 20–22. **Supan.**
Die Erforschung der höheren Luftschichten über dem Atlantischen Ozean im Sommer 1905. Von Prof. Dr. A. Supan.

Meteorology—Clouds. *Monthly Weather Rev.* **33** (1905): 438. **Proctor.**
Standing Clouds among the North Carolina Mountains. By Frank W. Proctor.

Oceanography. *P.R.I.* **17** (1906): 547–551. **Monaco.**
The Progress of Marine Biology. By H.S.H. Albert I., Prince of Monaco. *With Illustrations.*

Oceanography. *Ann. Hydrographie* **34** (1906): 66–72. **Nathansohn.**
Vertikale Wasserbewegung und quantitative Verteilung des Planktons im Meere. Von Alexander Nathansohn.

Oceanography—Atlantic. *C. Rd.* **142** (1906): 116–117. **Chevallier.**
Courants marins profonds dans l'Atlantique Nord. Note de A. Chevallier.

Oceanography—Pacific. **Flint.**
A Contribution to the Oceanography of the Pacific. Compiled from data collected by the United States steamer *Nero* while engaged in the survey of a route for a Trans-Pacific Cable. By James M. Flint. (*B. United States Nat. Museum*, No. 55, 1905.) Pp. 62. *With Charts and Plates.*

Oceanography—Red Sea. *C. Rd.* **142** (1906): 410–412. **Gravier.**
Sur la faune annélidienne de la Mer Rouge et ses affinités. Note de C. Gravier.

Physical Geography. **Tarr.**
New Physical Geography. By Ralph S. Tarr. New York: the Macmillan Co.; London: Macmillan & Co., 1905. Size 7½ × 5¼, pp. xvi. and 458. *Maps and Illustrations. Price* 4*s.* 6*d. net. Presented by the Publishers.*

Seismology. *J. Coll. of Science, Tōkyō* **20** (1905): Article 9 (pp. 18). **Kusakabe.**
Modulus of Elasticity of Rocks and some Inferences relating to Seismology. By S. Kusakabe. *With Plates.*

Seismology. *Terrestrial Magnetism* **10** (1905): 81–96, 177–189. **Reid.**
Records of Seismographs in North America and the Hawaiian Islands. By H. F. Reid.

Zoogeography. *M.G. Ges. München* **1** (1905): 355–370. **Lampert.**
Der heutige Stand der zoogeographischen Forschung. Von Dr. K. Lampert.

Zoogeography—Bird Migrations. **Hübner.**
Abh. K. Leopold.-Carolin. Deutsch. A. Naturforscher **84** (1905): 309–409.
Wetterlagen und Vogelzug. Die Rotkehlchen-Wanderungen an der deutschen Ostseeküste und über den europäischen Kontinent. Von Prof. Ernst Hübner. *With Diagrams.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Colonies. **Supan.**
Die territoriale Entwicklung der Europäischen Kolonien. Von Prof. Dr. Alexander Supan. Gotha: Justus Perthes, 1906. Size 11 × 7½, pp. xii. and 344. *Maps. Price* 12*m. Presented by the Author.* [To be reviewed.]

Commercial Geography. **Halle.**
Die Weltwirtschaft. Ein Jahr- und Lesebuch. Herausgegeben von E. von Halle. 1. Jahrgang, 1906; 1. Teil. Internationale Uebersichten. Leipzig und Berlin: B. G. Teubner, 1906. Size 11½ × 7½, pp. viii. and 366. *Price* 6*m. Presented by the Publisher.* [To be reviewed.]

Sociology. **Galton and others.**
Sociological Papers. Volume 2. By Francis Galton, P. Geddes, M. E. Sadler, E. Westermarck, H. Höffding, J. H. Bridges, and J. S. Stuart-Glennie. London: Macmillan & Co., 1906. Size 10½ × 7, pp. xiv. and 312. *Price* 10*s.* 6*d. Presented by the Sociological Society.*
Prof. Geddes continues his discussion on the scientific study of the city, commenced in vol. 1.

BIOGRAPHY.

Nordenskiöld. *Acta S. Sc. Fennicæ* **31** (1903) [Appendix]: pp. 29. **Ramsay.**
Minnestal öfver professorn friherre Adolf Erik Nordenskiöld, hallet vid Finska Vetenskaps-Societetens årshögtid den 29 April 1902 af Wilhelm Ramsay. *With Portrait.*

Richter. *M.G. Ges. München* **1** (1905): 371–392. **Günther.**
Eduard Richter. Von Siegmund Günther. *With Portrait.*

Richthofen. ———
Gedächtnisfeier der Gesellschaft für Erdkunde zu Berlin für Ferdinand Freiherr von Richthofen, 29. Oktober 1905. Size 10½ × 7, pp. 26. *Portrait.*

Santarem. **d'Eça.**
B.S.G. Lisboa **23** (1905): 5–20, 70–78, 114–120, 133–143, 165–171, 245–250, 277–282, 309–314, 357–360, 404–413, 421–443.
Algumas cartas ineditas do Visconde de Santarem, com uma introducção e notas. Por Vicente Almeida d'Eça.

GENERAL.

Educational. *G. Anzeiger* **6** (1905): 267–272. **Ankel.**
Drei Jahre Erdkunde in den Oberklassen einer Oberrealschule. Von Dr. Otto Ankel.

Educational. *G. Anzeiger* **6** (1905): 272–875. **Fischer.**
Reformbestrebungen im französischen Erdkundeunterricht. Von Heinrich Fischer.

Educational. *School World* **7** (1905): 408–412. **Gregory and Smith.**
Geography in Secondary Schools. Regulations of the Board of Education. I. By Prof. R. A. Gregory. II. By T. Alford Smith.

Educational—Maps. *J. of G.* **4** (1905): 373–377. **Goode.**
A Model Series of Base Maps. By J. Paul Goode. *With Diagram.*
On a series of outline maps by Lieut.-Col. Staggemeier of Copenhagen.

Geography. *J. of G.* **4** (1905): 386–396. **Baber.**
The Scope of Geography. By Zonia Baber.

German Colonies. *Globus* **89** (1906): 77–82. **Singer.**
Der Stand der geographischen Erforschung der deutschen Schutzgebiete. Von H. Singer.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**
Ordnance Survey of England and Wales:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from May 1 to 31, 1906.

1-inch (third edition):—
In outline, 203, 225, 233. **1*s.* *each*** (engraved).
Printed in colours, folded in cover or flat in sheets (258 and part of 259). *Price, on paper*, **1*s.* 6*d.***; ***mounted on linen*, 2*s.* *each.***

6-inch—County Maps—(first revision):—
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25-inch—County Maps (first revision):—
Cardiganshire, XXIX. 16; XXXVII. 4, 8, 12; XXXVIII. 5, 9; XLIV. 3, 4. **3*s.* *each.*** XXXVII. 11; XXXVIII. 14. **1*s.* 6*d.* *each.*** **Carmarthenshire**, XII

3, 4; XIII. 8, 14; XXII. 6, 14, 15, 16; XXIII. 13, 14, 15, 16; XXIV. 13, 14, 15, 16; XXV. 13, 14, 15, 16; XXVI. 13, 14, 16; XXVII. 13, 14; XXX. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12; XXXI. 5; XXXII. 3; XXXIV. 2, 4, 5, 6; XXXV. 1, 2, 5. **Devonshire**, XXXIX. 3, 5, 6, 7, 9, 10, 13, 14, 15; XL. 1, 5, 9, 13, 14, 15, 16; LI. 2, 3, 4, 6, 7, 8, 10, 14, 15, 16; LII. 9; LXIII. 1, 3, 5, 11, 12, 13, 16; LXIV. 1, 5, 9, 13; LXXV. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16; LXXVI. 1, 5, 9, 13; LXXXVIII. 1, 5, 9, 13; CXXXIII. 2, 3, 6, 9, 10, 15; CXXXVI. 2, 4; CXXXVII. 1, (2 and 3), 5, 6, 10. **Lincolnshire**, L. 8, 12; LIX. 4; LX. 3, 15; LXII. 1, 4, 8, 12, 13, 16; LXIII. 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16; LXIV. 5, 10, 11, 14; LXXVI. 1, 2, 3, 5, 7, 9, 10, 11, 13, 14, 15, 16; **Norfolk**, IV. 15, 16; IX. 4, 12; X. 3, 5, 7; XVII. 12; XVIII. 1, 3, 5, 6, 14; XXVI. 4, 12, 16; XXVII. 1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15; XXXVII. 4, 8, 12, 16; XLIX. 4, 8, 13, 16; LXI. 3; LXVI. 3, 7, 9, 10, 11, 13, 14, 15; LXXII. 8, 12; LXXIII. 1, 5, 10, 14, 15; LXXVIII. 1, 2, 3, 7; LXXX. 5. **Suffolk**, II. 1, 2, 3, 7; **Yorkshire** (First Revision of 1891 Survey), CCLX. 16; CCLXIV. 15; CCLXVI. 10, 13; CCLXXVII. 3; CCLXXVIII. 6, 7, 10, 11, 14, 15. 3*s. each.*

(*E. Stanford, London Agent.*)

England and Wales. **Geological Survey.**

Map of the British Islands. Scale 25 miles to 1 inch. *Price, coloured*, 2*s.*; *uncoloured*, 1*s.*

This map will be issued to educational authorities, universities, and schools at reduced prices—1*s.* per copy coloured, and 6*d.* uncoloured, provided not less than 20 copies of either are taken at one time.

Applications for maps at the reduced prices must be made direct to the Ordnance Survey, Southampton.

(*E. Stanford, London Agent.*)

Germany. **Rauers.**

Versuch einer Karte der alten Handelsstrassen in Deutschland. Von F. Rauers. Scale 1 : 1,500,000 or 1 inch to 23·6 stat. miles. 2 sheets. *Petermanns Mitteilungen*, Jahrgang 1906, Tafel 6. Gotha : Justus Perthes, 1906. *Presented by the Publisher.*

This map accompanies the author's paper in the March number of *Petermanns Mitteilungen* upon the history of the old German trade routes. It is an outline-map only, on a fairly large scale, measuring 31 × 38 inches, and shows the early trade routes in red. These lines are distinguished, as to their character and importance, by the symbol by which they are represented.

Russia. **Peucker.**

Die Eisenbahnen des europäischen Russland mit Theilen der angrenzenden Länder und Klein-Asiens. Neu bearbeitet von Dr. K. Peucker. Scale 1 : 6,336,000 or 1 inch to 100 stat. miles. Vienna : Artaria & Co., 1906. *Price* 1.50*m. Presented by the Publisher.*

A new edition of a useful little railway map of Russia, printed in colours. In the north-east and south-east corners of the map an alphabetical index to the various railway lines is given, which will be useful for reference.

Turkey. **Topographical Section, General Staff.**

Map of Turkey. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheet : Constantinople. London : Topographical Section, General Staff, War Office, 1906. *Price* 2*s.* 6*d. Presented by the Director of Military Operations.*

The area included in this sheet extends from lat. 40° 35′ N. to 41° 25′ N., and from long. 27° 40′ E. to 29° 20′ E. Constantinople and the Bosphorus thus appear on the eastern side of the sheet. Land relief is shown by approximate contours in brown, at 100 feet intervals; water, including river and sea names, in blue; forest areas, green; and the rest of the map is in black. The general effect is very satisfactory. It is intended that the map should eventually include the whole of Turkey, but this will take considerable time.

ASIA.

Palestine. **Mackinder.**

Stanford's new orographical map of Palestine. Compiled under the direction of H. J. Mackinder, M.A. Scale 1 : 253,440 or 1 inch to 4 stat. miles. London : Edward Stanford, 1906. *Price* 16*s. Presented by the Publisher.*

This forms one of the series of orographically coloured wall maps, prepared under the superintendence of Mr. H. J. Mackinder, and now being published by

Mr. E. Stanford. Numerous sources of information have been taken advantage of in the preparation of this map, especially the surveys of the Palestine Exploration Fund. It is satisfactory to find that land elevation is shown by white and tints of brown only, instead of green and brown as is frequently the case, although in the Dead sea depression it has been found necessary to employ another tint, and a neutral tint has been selected for this, as green so easily suggests vegetation. As in the previous maps of the series, the names are printed in an almost transparent grey, which enables a fair number to be inserted without interfering with the graphic appearance of the map. The depth of the sea is indicated by tints of blue. Old Testament, New Testament, classical, and modern place-names are distinguished by the style in which they are printed.

Sechuan. **Topographical Section, General Staff.**

Province of Sŭ-Ch'uan (Eastern sheet). (Provisional issue without hills.) Compiled in the Topographical Section, General Staff. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. London : Topographical Section, General Staff, War Office, 1906. *Price 2s. 6d. Presented by the Director of Military Operations.*

Although only a provisional issue, without hills, this sheet contains a large amount of information, and no pains have been spared to render it as complete as the scale will admit. A reference to the list at the foot of the sheet shows that no less than twenty-eight different authorities and sources of information have been utilized in compiling the sheet. Special attention has been paid to the nomenclature, and an explanation of the usual terminations is given. The sheet is printed in colours, and extends from lat. 28° N. to 33° N., and from long. 103° E. to 111° E.

AFRICA.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. Sheet 84, Nouvelle Anvers. Topographical Section, General Staff, War Office, 1906. *Price 2s. Presented by the Director of Military Operations.*

Africa. **Fraunberger.**

Jährliche Regenmengen auf dem Festlande von Afrika. Gezeichnet von Georg Fraunberger. Scale 1 : 25,000,000 or 1 inch to 394·5 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1906, Tafel 7. Gotha : Justus Perthes, 1906. *Presented by the Publisher.*

In the preparation of this most useful general rainfall map of Africa, the author has consulted the best available sources of information. These he refers to in his paper, "Studien über die jährlichen Niederschlagsmengen des afrikanischen Kontinents," which the map accompanies, and which gives a valuable *résumé* of our present knowledge of the subject. The geographical basis of the map is the map in Stieler's Hand Atlas, and upon this the annual rainfall is indicated by twelve different tints. Stations where actual measurements are made are indicated, and insets on enlarged scales are given of the Kameruns and East Africa. In many parts of the continent as yet little exact information exists for constructing a map of this kind, but the rapid opening up of the continent renders it now possible to arrive at a much better general idea than was ever possible before.

Egypt. **Survey Department, Cairo.**

Map of Egypt. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Sheets : S.E., Nos. I.-II., II.-I., II.-II., III.-II., XXIV.-VI. and VII., XXIX.-VIII. Cairo : Survey Department, 1906. *Presented by the Director-General, Survey Department, Cairo.*

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheet 24, Lake of the Woods, revised to March 24, 1906. Ottawa : Department of the Interior, Topographical Surveys Branch, 1906. *Presented by the Canadian Department of the Interior.*

GENERAL.

World. **Stieler.**

Neunten, von Grund aus neubearbeiteten und neugestochenen Auflage von Stielers Hand-Atlas. 100 Karten auf 200 Seiten mit 162 Nebenkarten in Kupferstich und einem alphabetischen Verzeichnis aller im Atlas vorkommenden Namen (ungefähr 240,000 Namen enthaltend) herausgegeben von Justus Perthes' Geographischen

Anstalt in Gotha. Lieferung 1. Gotha: Justus Perthes, 1906. *Price* 60 *pf. each part.*

Although less than a year has passed since the completion of the last edition of Stieler's Hand-Atlas, a new edition has already been commenced. This is a clear indication that the atlas is, as it deserves to be, still extremely popular, and that the pains that have been taken to maintain for it a high standard of excellence and reliability is appreciated. In the geographical world changes are continually taking place—alterations in boundary-lines, new and more exact surveys, polar explorations, and other events, are constantly rendering map revision and correction necessary, and recently this has perhaps been more than ever the case. The Russo-Japanese war and new boundary surveys in Africa and elsewhere have already put some of the sheets of this atlas out of date. There is no alteration in the general appearance of the maps in this edition, but they are all being carefully revised and corrected. The first part, which has just appeared, contains—Sheets: 15, Ostalpen (Alpenländer, östliches Blatt), 1:925,000, by C. Sherrer and H. Habenicht; 42, Süd-Skandinavien, 1:2,500,000, by C. Sherrar; 72, Afrika, 1:750,000; 4, Kongo, Deutsch-Ostafrika, etc., by C. Barich. In addition to these, the part contains the first section of the alphabetical index.

Upon sheet 72 the corrected position of Lake Albert Edward is given, together with the newly delimited boundary-line between Uganda and German East Africa.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during March and April, 1906. *Presented by the Hydrographer, Admiralty.*

No.	Inches.	
3552 m	= 3·47	White sea:—Approaches to Shuya river. 3*s.*
1846 m	= 10·0	France, south coast:—Villefranche bay. 2*s.*
3344 m	= 1·23	San Domingo, north coast:—Monte Cristi bay and approaches. 2*s.*
3559 m	= 2·75	Philippine islands:—Bolinao harbour and approaches. 3*s.*
3544 m	= 5·96	China, east coast. Mirs bay:—Starling inlet, Crooked harbour, and Double haven. 4*s.*
3541 m	= 2·9	Korea, south-east coast:—Masampo and Pu To channel. 3*s.*
803 m	= 9·9	New Zealand, north island:—Lambton harbour and Evans bay. 3*s.*
1312		Plans on the coast of Chile. New Plan:—Tongoi bay.
699 m	= 6·35	Plans on the east coast of Chile. Plan added:—Port Taltal.
840		Nicobar islands. Plans added:—Mus anchorage, Hoinipoh bay.
2193		Sketch-plan of anchorages between Mindinao and Celebes. New plan:—Channels between Tangulandang and Ruang.
1179 m	= 0·5	England, west coast:—Bristol channel. 5*s.*
555 m	= 1·4	Norway:—Dolm Sund to Lyngvær. 2*s.* 6*d.*
3567 m	= 14·0	Africa, north coast:—Marsa Matruh. 2*s.*
3560 m	= 8·7	Haiti or San Domingo:—San Pedro de Macoris. 2*s.*
3561 m	= 0·72	South America, east coast:—Entrance to the rivers Paraná and Uruguay. 2*s.*
1893 m	= 0·97	Chile. Plans on the east coast of Chiloe island:—Port Quellon and approaches. 2*s.*
3324 m	= {0·49 / 3·0}	India, west coast. Maldive islands, Mále and Fadiffolu atolls (Plan:—Mále anchorage). 4*s.*
1701 m	= {2·42 / 1·82}	Anchorages on the west coast of Sumatra:—Rigas and Chalang bays, Tabekat bay, Tarusan bay. 2*s.*
3470 m	= {0·3 / 1·21}	Celebes. Buton strait:—South Narrows, North Narrows. 2*s.*
1493 m	= var.	Japan, south-west islands. Plans in Tanega shima and Kuchinoyerabu shima:—Nishi no amate wan, Mage shima Shimama road, O ura, Kuchinoyerabu shima, Kuchinoyerabu wan. 2*s.*
2724		Plans of bays and ports in Candia or Crete. New plan:—Sitia bay.
318		River St. Lawrence. The Traverses. New plan:—Beaujeau channel, West Narrows.
2732 m	= {1·8 / 1·45}	Eastern archipelago. Plans of anchorages in Bali, Lombok, Sumbawa, and adjacent islands. Plans added:—Segara bay, Badung road.

No. Inches.

935 Eastern archipelago. Harbours and anchorages between Bali and Timor. New plan:—Cyrus harbour.

957 m = 1·44 Ports in the Philippine islands. Plan added:—Port Banga.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.	Cancelled by	No.
2406 Monte Cristi bay. Plan on this sheet.	New plan. Monte Cristi bay and approaches	3344
1276 Chile Herradura de Carrizal to Grande point. Plan of Port Taltal on this sheet.	New plan. Port Taltal	699
3392 Port Bolinao. Plan on this sheet.	New plan. Bolinao harbour and approaches	3559
1423 Plan of Lambton harbour on this sheet.	New plan. Lambton harbour and Evans bay	803
1179 England, west coast. Bristol channel.	New chart. England, west coast. Bristol channel	1179
374 Ras Bulau to Alexandria. Plan on this sheet:—Marsa Matru.	New plan. Marsa Matruh	3567
2859 Plans on the south coast of San Domingo. Plan on this sheet:—San Pedro de Macoris bay.	New chart San Pedro de Macoris	3560
1938 South America, east coast. River Uruguay from Martin Garcia to Paysandu and Salto Grande.	New charts. Entrance to river Paraná and Uruguay	3561
	Uruguay river, parts I. and II.	3549*
	Uruguay river, parts III., IV., V.	3550*
2760 Acheh head to Tyingkok bay. Plan on this sheet:—Rigas bay.	New chart. Anchorages on the west coast of Sumatra, Rigas, and Chalang bays, Tabekat bay, Tarusian bay	1701
2284 Plans of anchorages on the west coast of Sumatra. Plan on this sheet:—Tabekat bay.		
2196 Sketch plan of anchorages in the southern part of Celebes. Plan on this sheet:—Buton road.	New Chart. Buton strait, South Narrows, North Narrows	3470

Charts that have received Important Corrections.

No. 469, Spain:—Port of Alicante. 2819, France:—Ciotat and Sanary bays with adjacent roadsteads. 1744, France:—Gulf of St. Tropez. 847, Cyprus:—Famagusta and Salamis, Famagusta harbour. 331, United States, east coast:—Wassau, Ossaban, St. Catharine's and Sapelo sounds. 3005, Gulf of Mexico:—Tortugas harbour and approaches, 1318, Chile:—Port of Valdivia and approaches. 1697, Africa, west coast:—Garraway point to Growa point. 625, Africa, west coast:—River Congo from the entrance to Matadi. 2899, Indian ocean islands:—Chagos archipelago to Madagascar. 3, Indian ocean islands:—Chagos archipelago. 4, Indian ocean islands:—Principal groups of the Chagos archipelago. 942*a*, Eastern archipelago:—Eastern portion, Sheet I. 942*b*, Eastern archipelago:—Eastern portion, Sheet II. 2575, Celébes:—Celébes sea, eastern part. 2578, Philippine islands:—Eastern part of the Sulu or Mindoro sea. 2243, Japan:—Noto peninsula. 993, Japan:—Anchorages in Yezo island. 2726, New Zealand:—Manukau harbour. 2532, New Zealand:—Sheet ix. 90-mile beach to Otago. 3497, England, east coast:—Hull road. 1758, Spain, west coast:—Arosa and Pontevedra bays. 3408, Leeward islands:—Puerto Rico. 1751, South America, east coast:—Saucé point to Martin Garcia island. 2839, United States, west coast:—Columbia river. 638, Africa, west coast:—River Congo and adjacent creeks. 1881, Indian ocean islands:—Cargados Carajos shoals. 3296, Plans in Timor:—Koepang bay and approaches, Koepang road, Hausisi anchorage. 166, China, east coast:—Pagoda anchorage and approaches. 452, Japan:—Yezo island with adjacent straits.

(*J. Potter, Agent.*)

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* *See* Bi-monthly List, January–February, 1906.

Indian Ocean. **Meteorological Office.**

Meteorological Chart of the Indian Ocean north of 15° S. lat. and Red Sea for May and June, 1906. London: Meteorological Office, 1906. *Price* 6d. *Presented by the Meteorological Office.*

Liverpool Bay. **Belam and Ashton.**

Chart of Liverpool Bay. Surveyed by Commander Henry Belam, M.V.O., R.N., Marine Surveyor, and Henry G. G. Ashton, F.R.G.S., Assist. Marine Surveyor, Mersey Docks and Harbour Board, 1905. Scale 1:36,000 or 1·8 inch to a stat. mile. Liverpool: Mersey Docks and Harbour Board, 1905. *Presented by Henry G. G. Ashton, Esq.*

Mersey River. **Belam and Ashton.**

Chart of the River Mersey, from Rock Lighthouse to Eastham and Garston. Corrections to 1906. By Commander Henry Belam, M.V.O., R.N., Marine Surveyor, and H. G. G. Ashton, F.R.G.S., Assist. Marine Surveyor, Mersey Docks and Harbour Board. Scale 1:18,000 or 3·52 inches to a stat. mile. Liverpool, 1906. *Presented by H. G. G. Ashton, Esq.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for June, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for June, 1906. London: Meteorological Office, 1906. *Price* 6d. *Presented by the Meteorological Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for June, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

British East Africa. **Woodhouse.**

Thirteen photographs of the Tana river, British East Africa, taken by Alfred Woodhouse, Esq. *Presented by T. W. Barber, Esq.*

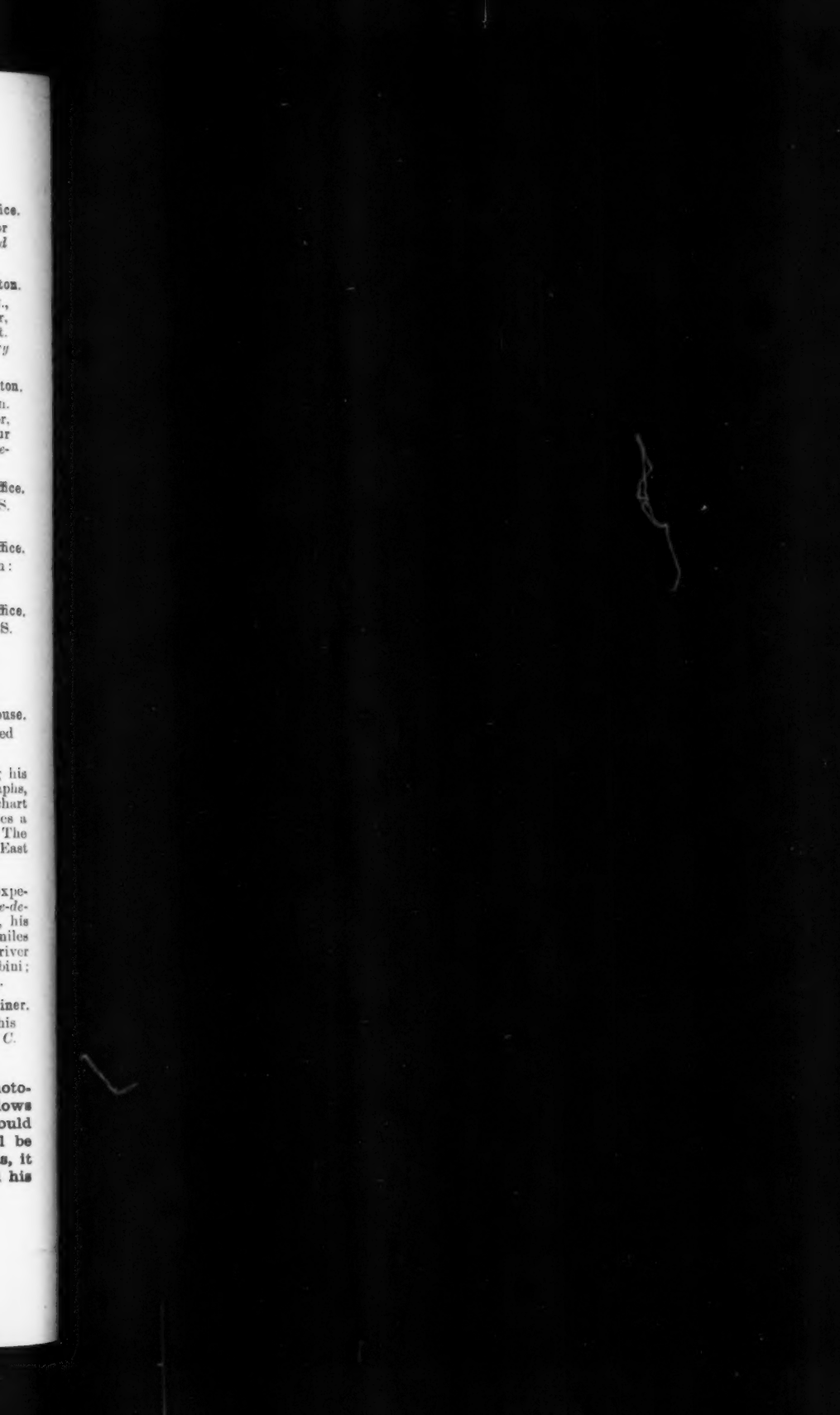
An interesting set of photographs taken by Mr. Alfred Woodhouse during his surveying expedition up the Tana river last year. In addition to the photographs, Mr. Woodhouse has presented the Society with a tracing of the large-scale chart which he and Mr. T. W. Barber, who accompanied him, made, and which gives a considerable amount of detailed information concerning the course of the river. The photographs are well taken, and give a good idea of the scenery of this part of East Africa. Those of native types are specially interesting.

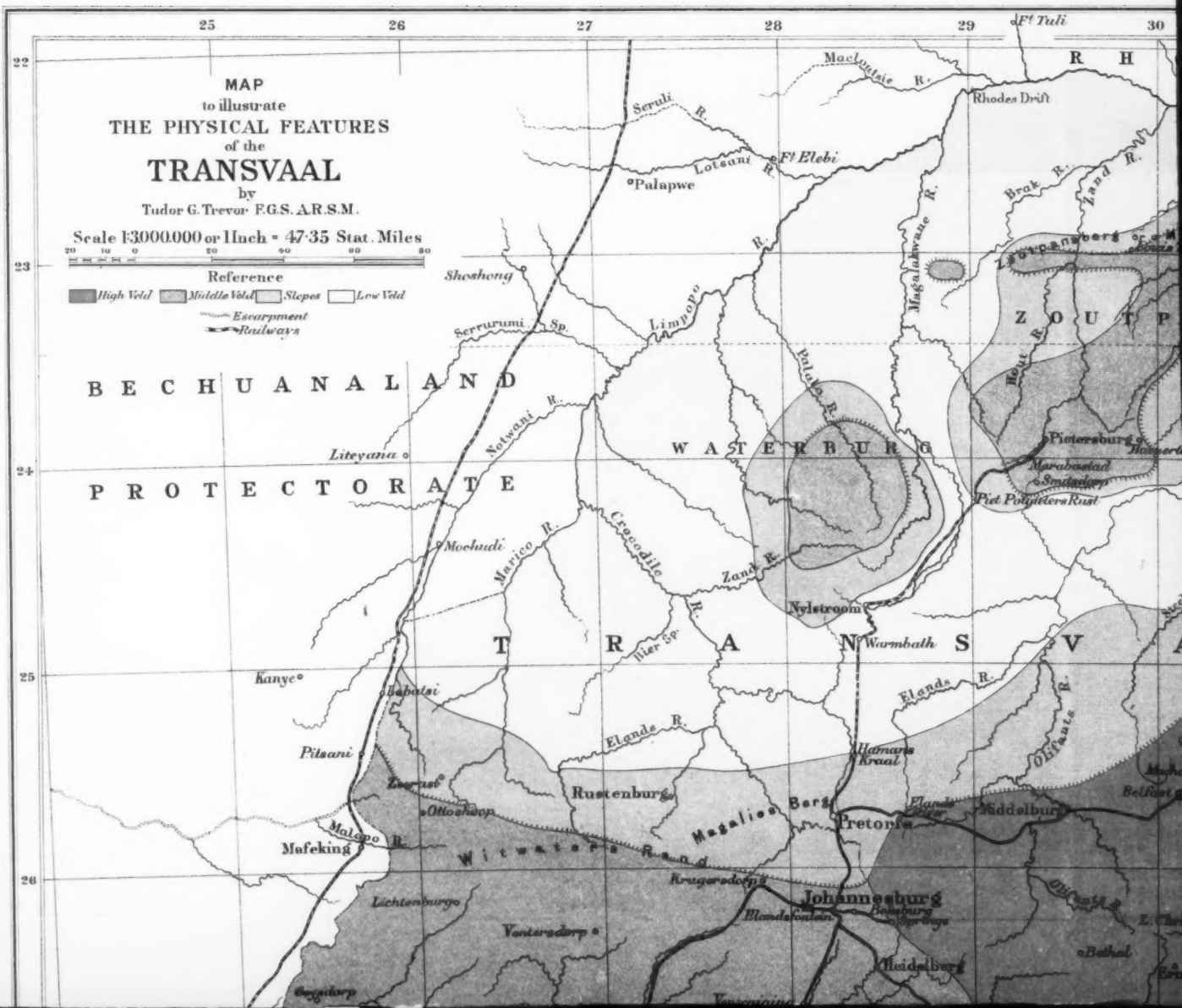
(1) Mouth of the Ozi and Tana at Kipini; (2) Launch *Mongolia*, used by the expedition; (3) Hargatzo rapids; (4) Guyo, the chief of the river Gallas, and his *aide-de-camp;* (5) Guyo's wife and two sisters at Oda Bororuba; (6) A Waboni chief, his mother, and two village belles; (7) Camp at Gurura; (8) View of the Tana, 300 miles from the coast; (9) Ariti; (10) Launch *Mongolia*, moored at junction of Tana river and Belezo canal; (11) Hameye, a Pokomo village; (12) The chief of Marumbini; (13) The old Tana bed, now nearly filled up, since the cutting of the Belezo canal.

Gambia. **Viner.**

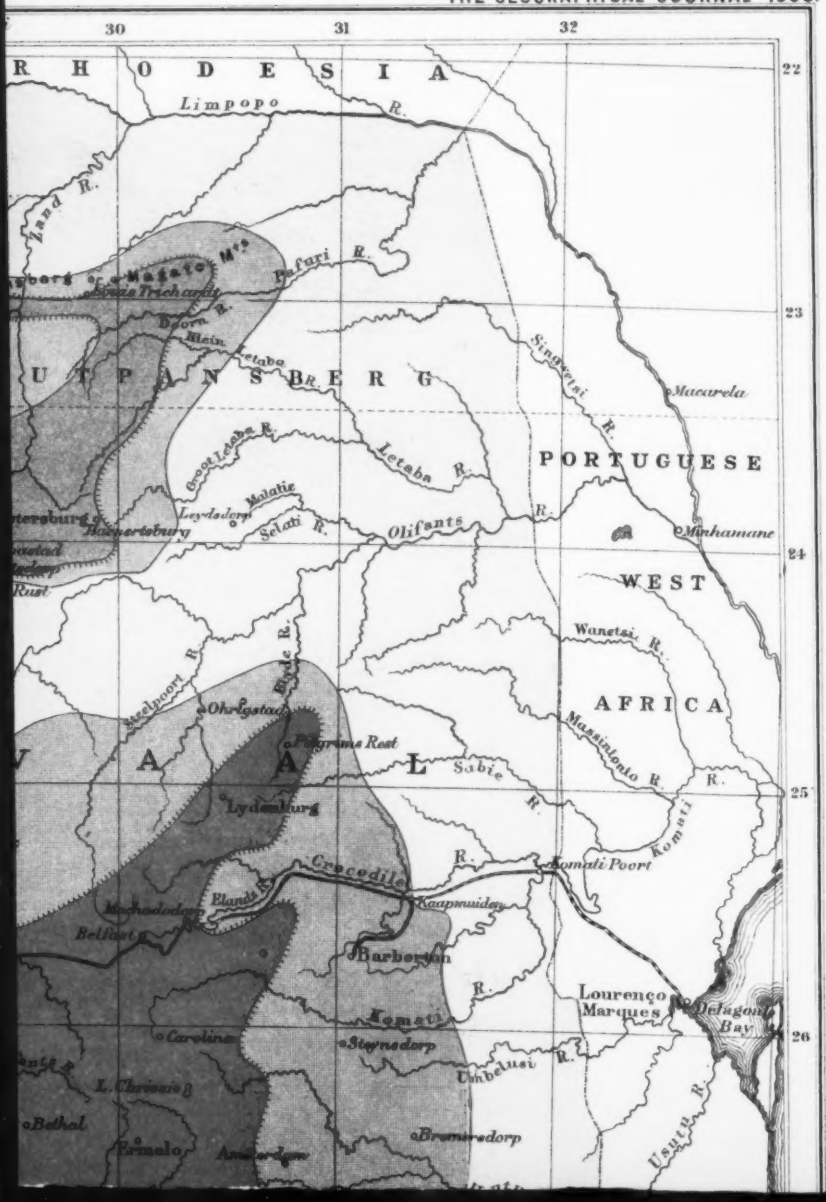
Photograph of King Musua Melea, chief of McCarthy Island, Gambia, with his chief headsman and executioner, taken by C. C. Viner, Esq. *Presented by C. C. Viner, Esq.*

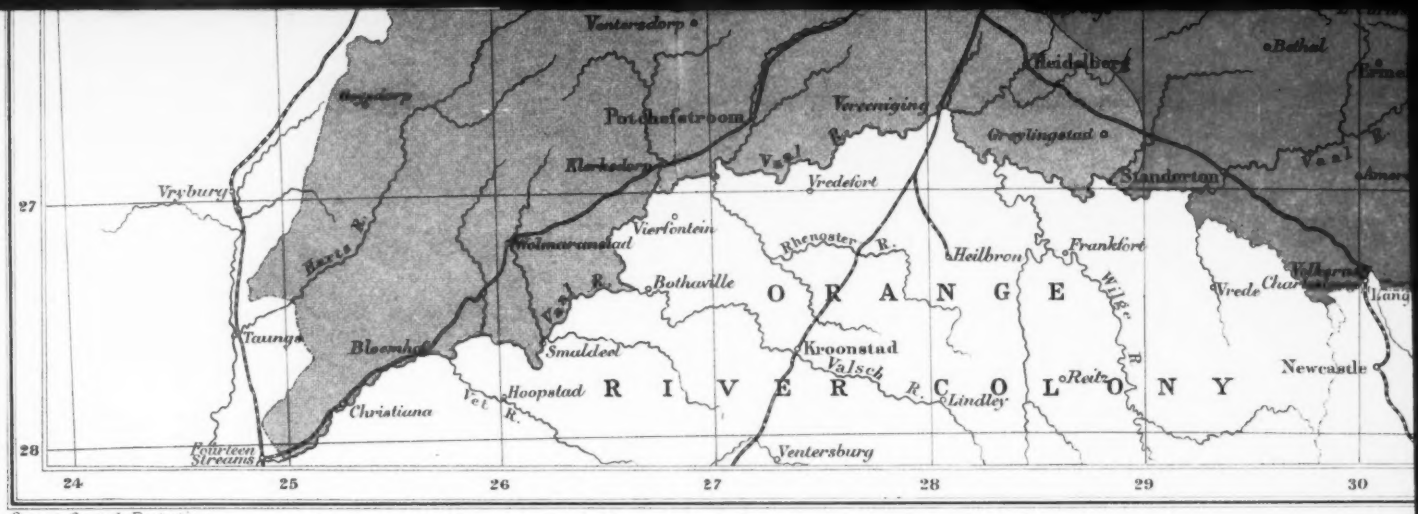
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.




MAP
to illustrate
THE PHYSICAL FEATURES
of the
TRANSVAAL
by
Tudor G. Trevor F.G.S. A.R.S.M.
Scale 1:3000000 or 1inch = 47·35 Stat. Miles
20 10 0 20 40 60 80
Reference
High Veld
Middle Veld
Slopes
Low Veld
Escarpment
Railways
BECHUANALAND
PROTECTORATE
TRANSVAAL
WATERBURG
ZOUTP
RH
Ft Tuli
Macloutsie R.
Rhodes Drift
Seruli R.
Ft Elebi
Lotsani R.
Palapwe
Brak R.
Zand R.
Magaliesberg
Shoshong
Limpopo R.
Serrurumi Sp.
Palala R.
Pietersburg
Marabastad
Smitsdorp
Piet Potgieters Rust
Setwani R.
Liteyana
Mochudi
Marico R.
Crocodile R.
Zand R.
Nylstroom
Warmbath
Hier Sp.
Kanye
Gabotsi
Pitsani
Elands R.
Olifants R.
Hamans Kraal
Zeerust
Ottoshoop
Rustenburg
Magalies Berg
Pretoria
Middelburg
Belfast
Malopo R.
Mafeking
Witwaters Rand
Krugersdorp
Johannesburg
Lichtenburg
Ventersdorp
Heidelberg
Bethal
22
23
24
25
26
27
28
29
30

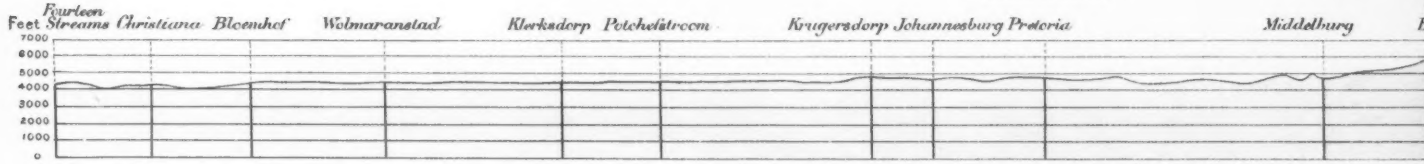
TRANSVAAL
TREVOR.





Secant Conical Projection.

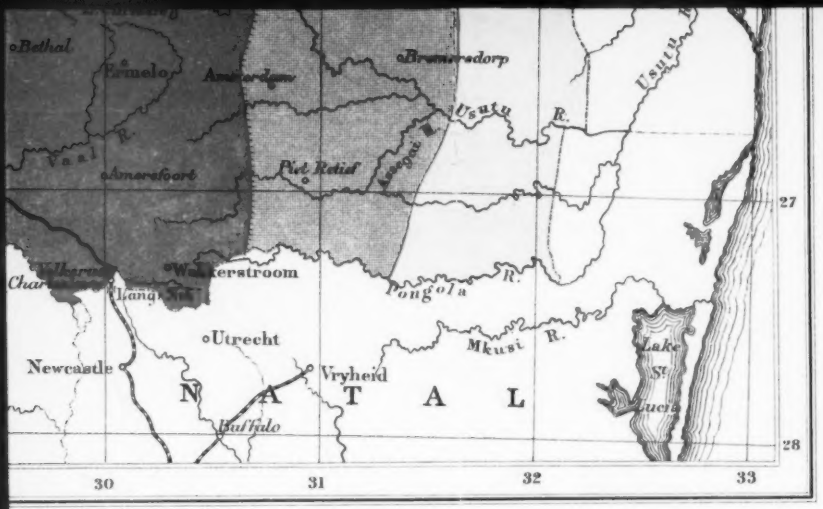
VOLKSRUST to RHODES DRIFT
(South to North)

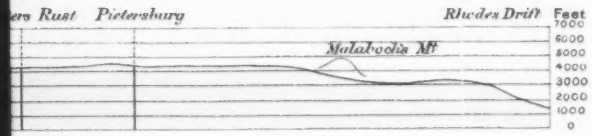


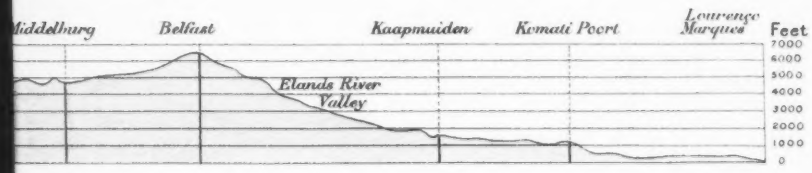
FOURTEEN STREAMS to LOURENCO MARQUES
(West to East)

Horizontal scale same as map, vertical scale exaggerated 25 times.

Published by the Royal Geographical Society.


Bethal
Ermelo
Amersfoort
Vaal R.
Piet Retief
Usutu R.
Pongola R.
Mkuzi R.
Lake St Lucia
Utrecht
Newcastle
Vryheid
N A T A L
Dundee
Wakkerstroom
27
28
30
31
32
33


Rhodes Drift
Feet
7000
6000
5000
4000
3000
2000
1000
0
Matabochis Mt


Middelburg
Belfast
Kaapmuiden
Komati Poort
Lourenço Marques
Feet
7000
6000
5000
4000
3000
2000
1000
0
Elands River Valley

25 times.